

2017

District of Columbia Building Code

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DC MURIEL BOWSER, MAYOR



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PREFACE

Background

The 2017 *District of Columbia Construction Codes*, effective May 29, 2020, consist of the following 12 codes:

- 2017 *District of Columbia Building Code* [2015 edition of the *International Building Code*® published by the International Code Council (ICC) as amended by the *District of Columbia Construction Codes Supplement of 2017* (DCMR 12A, Building Code Supplement)].¹
- 2017 *District of Columbia Residential Code* [2015 edition of the *International Residential Code*® published by the ICC as amended by the *District of Columbia Construction Codes Supplement of 2017* (DCMR 12B, Residential Code Supplement)].
- 2017 *District of Columbia Electrical* [2014 edition of the *National Electrical Code* published by the National Fire Protection Association (NFPA) as amended by the *District of Columbia Construction Codes Supplement of 2017* (DCMR 12C, Electrical Code Supplement)].
- 2017 *District of Columbia Fuel Gas Code* [2015 edition of the *International Fuel Gas Code*® published by the ICC as amended by the *District of Columbia Construction Codes Supplement of 2017* (DCMR 12D, Fuel Gas Code Supplement)].
- 2017 *District of Columbia Mechanical Code* [2015 edition of the *International Mechanical Code*® published by the ICC as amended by the *District of Columbia Construction Codes Supplement of 2017* (DCMR 12E, Mechanical Code Supplement)].
- 2017 *District of Columbia Plumbing Code* [2015 edition of the *International Plumbing Code*® published by the ICC as amended by the *District of Columbia Construction Codes Supplement of 2017* (DCMR 12F, Plumbing Code Supplement)].
- 2017 *District of Columbia Property Maintenance Code* [2015 edition of the *International Property Maintenance Code*® published by the ICC as amended by the *District of Columbia Construction Codes Supplement of 2017* (DCMR 12G, Property Maintenance Code Supplement)].
- 2017 *District of Columbia Fire Code* [2015 edition of the *International Fire Code*® published by the ICC as amended by the *District of Columbia Construction Codes Supplement of 2017* (DCMR 12H, Fire Code Supplement)].
- 2017 *District of Columbia Energy Conservation Code* [2013 edition of the Energy Standard for Buildings Except Low-Rise Residential Buildings (ANSI/ASHRAE/IES 90.1-2013) published by ASHRAE (formerly known as the American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc.) and the 2015 edition of the *International Energy Conservation Code*®—Residential Provisions published by the ICC as amended by the *District of Columbia Construction Codes Supplement of 2017* (DCMR 12I, Energy Conservation Code Supplement)].
- 2017 *District of Columbia Existing Building Code* [2015 edition of the *International Existing Building Code*® published by the ICC as amended by the *District of Columbia Construction Codes Supplement of 2017* (DCMR 12J, Existing Building Code Supplement)].
- 2017 *District of Columbia Green Construction Code* [2012 edition of the *International Green Construction Code*® published by the ICC as amended by the *District of Columbia Construction Codes Supplement of 2017* (DCMR 12K, Green Construction Code Supplement)].
- 2017 *District of Columbia Swimming Pool and Spa Code* [2015 edition of the *International Swimming Pool and Spa Code*® published by the ICC as amended by the *District of Columbia Construction Codes Supplement of 2017*, 12 DCMR L, Swimming Pool and Spa Code Supplement)].

1. The District of Columbia Municipal Regulations (DCMR) is the official compilation of rules and regulations issued by government agencies and the Council and is available online at: <http://dcregs.dc.gov/>.

The ICC, ASHRAE and NFPA Codes have been extensively amended by the District of Columbia to address specific District of Columbia policies and statutes, and unique characteristics of the District of Columbia.

The ICC and NFPA Codes provide a comprehensive, coordinated set of building safety and fire codes that have been adopted by 50 states and the District of Columbia at the jurisdictional or state level. The ICC's consensus-based code development process involves a broad range of stakeholders, including construction industry representatives and code regulators, to ensure that the model codes incorporate the latest technical advancements, while addressing industry and regulatory concerns. The ICC Codes also provide helpful resources, such as interpretive commentary and history of amendments, which provide a basis for interpreting the *District of Columbia Construction Codes*.

In 1791, President George Washington issued the first building guidelines in Washington, DC. These guidelines largely emphasized aesthetics in order to ensure that new buildings complemented Pierre L'Enfant's plan for the city. By 1872, during a period of rapid change and expansion after the Civil War, the District of Columbia adopted the first comprehensive set of building regulations focusing on health and safety concerns. The 1872 regulations, introduced by the Congressionally established Board of Public Works, required building permits for the first time. Nineteenth century building regulation also included The Height of Buildings Act, enacted by Congress in 1899 to address safety concerns about the use of steel framing. The greater building heights achieved by steel-framed structures raised concerns about the city's ability to extinguish fires, and the possibility of structural collapse.

Consistent with the growing national trend towards nationally-recognized model building codes, in 1986 the District of Columbia adopted five of the 1984 codes published by the Building Officials Code Administrators (BOCA) International along with model codes published by the Council of American Building Officials and the National Fire Protection Association. In 1994, after BOCA combined with other model code groups to establish the ICC with a common goal of developing a single coordinated set of national model building codes, the District of Columbia began transitioning to the ICC's International Codes® (I-Codes®). Beginning in 1999 the District of Columbia adopted the 1996 *International Mechanical Code* and 1995 *International Plumbing Code*, and completed the transition to the I-Codes in 2003, when nine of the 2000 edition of the I-Codes were adopted.

Following the 2008 update of the *District of Columbia Construction Codes*, and in recognition of the need for a more robust, responsive and ongoing code development process in the District of Columbia, a new Construction Codes Coordinating Board (CCCB) was created by Mayoral Order in March 2009 to replace the Building Code Advisory Committee.² The members of the CCCB are appointed by the Mayor (except for one member appointed by the DC Council) and represent various stakeholders in the code development process, including architects, engineers, government regulators, representatives of the construction and housing industries and city residents. The CCCB is supported administratively by the District of Columbia Department of Consumer and Regulatory Affairs (DCRA) and has been delegated authority by the Mayor to issue rules to amend the Construction Codes and to adopt the model codes pursuant to procedures set forth in the DC Official Code, §6-1409.

In considering adoption of the ICC, ASHRAE and NFPA codes and reviewing local code change proposals, the CCCB considers relevant criteria and policies including:

- Minimum performance standards and requirements for construction and construction materials, consistent with nationally accepted standards of engineering, fire, and life safety.
- Unique District of Columbia characteristics, policies or statutes.
- The use of modern technical methods, devices and improvements.
- Elimination of restrictive, obsolete, conflicting, duplicative, and unnecessary regulations and requirements.
- Standards to make buildings and facilities accessible to and usable by physically disabled persons.

2. Mayor's Order 2009-22 (February 25, 2009), as amended by Mayor's Order 2012-32 (February 29, 2012).

Consideration of the 2012 I-Codes and the 2011 *National Electrical Code* began in October 2011 at the direction of Mayor Vincent C. Gray who tasked the CCCB with meeting Mayor Gray's stated goal of making the District of Columbia the healthiest, greenest and most livable city in the United States. By adopting the 2012 *International Green Construction Code* and the 2012 *International Energy Conservation Code* as mandatory codes applicable to public and private sector buildings, the District of Columbia has taken a national leadership role in establishing a regulatory framework for fostering green building practices.

Development of the next update to the DC Construction Codes began in 2015 with a review of the 2015 I-Codes, 2013 *ANSI/ASHRAE/IES 90.1-2013* and 2014 *National Electrical Code*. Initiated by Mayor Muriel Bowser, the CCCB was tasked with simplifying the codes for both project teams and enforcement staff, while continuing to advance the District's energy efficiency goals embodied in the Sustainable DC plan.

The Code Development Process

Although administered by DCRA, the code development process reached well beyond the agency's corridors. In addition to the Board members who met frequently, often weekly, over a four year period, more than 100 individuals, including architects, engineers, contractors, property managers, real estate developers and government regulators, contributed countless hours attending technical advisory group meetings, as they pored over the model codes and developed code change amendments to reflect and incorporate local District of Columbia policies and concerns.

This process resulted in more than 500 code change proposals, incorporated into the 2017 *District of Columbia Construction Codes Supplement*. Two rounds of public comment were sought through a rulemaking process, consisting of a Notice of Proposed Rulemaking (65 DCR 40-Part 2, September 28, 2018) and a Second Notice of Proposed Rulemaking (66 DCR 31-Part 2, July 26, 2019).

Final recommendations were sent by DCRA to the Mayor and subsequently introduced to the District of Columbia Council on January 30, 2020. The Codes were passively approved by the Council on April 9, 2020 and became effective on May 29, 2020 when a Notice of Final Rulemaking was published in the DC Register (67 DCR 23-Part 2, May 29, 2020).

Structure of the 2017 District of Columbia Construction Codes

Since the District of Columbia Construction Codes consist of the ICC, ASHRAE and NFPA model codes as modified by the *District of Columbia Construction Codes Supplement*, the model codes and the local supplement must be consulted together to determine the complete text of the *District of Columbia Construction Codes*. The I-Codes are available on the ICC's website at <http://public-codes.cyberregs.com/icod>. ASHRAE 90.1-2013 is available at https://www.techstreet.com/ashrae/standards/ashrae-90-1-2013-si?gateway_code=ashrae&product_id=1865967.

The *District of Columbia Construction Codes Supplement* contains the local District of Columbia amendments and modifications and is codified in Title 12 of the DCMR. Title 12 can be viewed online on the website hosted by the Office of Documents and Administrative Issuances (ODAI): <http://www.dcregs.dc.gov>³

To assist the public, three of the District of Columbia Construction Codes may also be viewed in an integrated version, published by the ICC, which consolidates the respective ICC codes, ANSI/ASHRAE/IES 90.1-2013 and the District of Columbia amendments. The three integrated codes are available to the public through a link on the DCRA website, which enables online reading and limited downloading. These codes are as follows:

- 2017 *District of Columbia Building Code*
- 2017 *District of Columbia Energy Conservation Code*
- 2017 *District of Columbia Green Construction Code*

3. Title 12 of the DCMR is also available on the DCRA website.

A solid vertical line in the margin within the body of the integrated Building Code published by the ICC indicates a District of Columbia change in the text of the respective model code.

Consistent with prior practice in the District of Columbia, Chapter 1 of the *District of Columbia Building Code* contains administrative and enforcement provisions that apply to all the individual codes that comprise the District of Columbia Construction Codes, with the exception of the *Property Maintenance Code* and the *Fire Code*. Administrative and enforcement provisions for the *Property Maintenance Code* and the *Fire Code* are set forth in 12-G DCMR, Chapter 1, and 12-H DCMR, Chapter 1, respectively.

Effective Date

The 2017 *District of Columbia Construction Codes* became effective May 29, 2020, and apply to all new and existing construction and buildings in the District of Columbia, unless otherwise excepted or excluded, subject to the transition provisions set forth in Section 123 of the Building Code, which allows continued use of the 2013 *Construction Codes* under specified circumstances.

Citation

The *District of Columbia Construction Codes* should be cited by referencing the ICC, ASHRAE or NEC provision if applicable, or the local District of Columbia amendment set forth in 12 DCMR. Alternatively, a specific provision can be cited by referencing the applicable District of Columbia Construction Code, e.g., 2017 *District of Columbia Property Maintenance Code*, Section 404.1.

Codes Maintenance

At the national level, the model codes are kept current through the review of proposed changes submitted to the organizing body by code enforcement officials, industry representatives, design professionals and other interested parties. Proposed changes are considered through an open code development process in which all interested and affected parties may participate. New model codes are issued on a three-year cycle.

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CHAPTER 1

ADMINISTRATION AND ENFORCEMENT

SECTION 101 GENERAL

101.1 The Construction Codes. *The 2017 District of Columbia Construction Codes*, hereinafter referred to as the “*Construction Codes*,” shall consist of:

1. The following Model Codes:
 - 1.1. The *International Building Code* (2015) published by the International Code Council, Inc. (ICC).
 - 1.2. The *International Residential Code* (2015) published by the ICC.
 - 1.3. The *National Electrical Code* (2014) published by the National Fire Protection Association (NFPA).
 - 1.4. The *International Fuel Gas Code* (2015) published by the ICC.
 - 1.5. The *International Mechanical Code* (2015) published by the ICC.
 - 1.6. The *International Plumbing Code* (2015) published by the ICC.
 - 1.7. The *International Property Maintenance Code* (2015) published by the ICC.
 - 1.8. The *International Fire Code* (2015) published by the ICC.
 - 1.9. The Energy Standard for Buildings Except Low-Rise Residential Buildings (ANSI/ASHRAE/IES 90.1—2013) published by ASHRAE (formerly known as the American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc.) and the *International Energy Conservation Code—Residential Provisions* (2015) published by the ICC.
 - 1.10. The *International Existing Building Code* (2015) published by the ICC.
 - 1.11. The *International Green Construction Code* (2012) published by the ICC.
 - 1.12. The *International Swimming Pool and Spa Code* (2015) published by the ICC.
2. All additions, insertions, and deletions to the Model Codes, as identified in the *District of Columbia Construction Codes Supplement of 2017* (the *Construction Codes Supplement*), codified in Title 12 of the District of Columbia Municipal Regulations (DCMR).
3. Appendices in the Model Codes shall not apply unless specifically adopted in the *Construction Codes Supplement*.

101.1.1 Authority to adopt Construction Codes. The *Construction Codes* are adopted in the District of Colum-

bia pursuant to the provisions of the *Construction Codes Act* (as defined in Section 202.2).

101.1.2 Administration and enforcement. Chapter 1 of 12-A DCMR shall serve as the administrative and enforcement provisions for the *Building Code*, *Residential Code*, *Electrical Code*, *Fuel Gas Code*, *Mechanical Code*, *Plumbing Code*, *Energy Conservation Code*, *Existing Building Code*, *Green Construction Code* and *Swimming Pool and Spa Code*, except as otherwise provided herein. Administrative and enforcement provisions for the *Property Maintenance Code* and the *Fire Code* are set forth in 12-G DCMR, Chapter 1, and 12-H DCMR, Chapter 1, respectively.

101.1.3 Definitions. Italicized words and terms shall have the meanings set forth in the *Construction Codes*.

101.2 Building Code. The *District of Columbia Building Code 2017 (Building Code)* shall consist of the 2015 edition of the *International Building Code*, as amended by the Building Code Supplement of 2017 (12-A DCMR) of the *District of Columbia Construction Codes Supplement of 2017*.

101.2.1 Appendices. Provisions in the appendices of the *International Building Code* shall not apply unless specifically adopted in the *Construction Codes Supplement*.

101.2.2 Administration and enforcement. Chapter 1 of the *International Building Code* is deleted in its entirety. In its place, the provisions of 12-A DCMR A, Chapter 1, shall apply to the *Building Code* and are incorporated herein by this reference.

101.2.3 Scope. The provisions of the *Building Code* shall apply to the construction, *alteration*, addition, relocation, enlargement, replacement, *repair*, equipment, use and occupancy, location, maintenance, removal, *demolition* and *raze* of every *building* or structure or any appurtenances connected or attached to such *buildings* or *structures*.

Exceptions:

1. Detached one- and two-family *dwelling*s and *townhouses* not more than three stories above grade plane in height with a separate means of egress and their accessory *structures* that comply with the *Residential Code* and Chapters 17, 18, 32 and 33 of the *Building Code*.
2. Existing buildings undergoing repair, alteration, addition or change of occupancy that comply with the *Existing Building Code*.
3. Home day care in dwelling units in Group R-3 *dwelling*s that comply with Appendix M of the *Residential Code*.

101.2.4 Intent. The purpose of the *Building Code* is to establish the minimum requirements to provide a reasonable level of safety, public health and general welfare through structural strength, *means of egress* facilities, stability, sanitation, adequate light and ventilation, energy conservation, accessibility, sustainability, and safety to life and property from fire and other hazards attributed to the built environment, and to provide a reasonable level of safety to fire fighters and emergency responders during emergency operations.

101.3 Residential Code. The *District of Columbia Residential Code* (2017) (*Residential Code*) shall consist of the 2015 edition of the *International Residential Code* as amended by the Residential Code Supplement of 2017 (12-B DCMR) of the *District of Columbia Construction Codes Supplement of 2017*.

101.3.1 Appendices. Provisions in the appendices of the *International Residential Code* shall not apply unless specifically adopted in the *Construction Codes Supplement*.

101.3.2 Administration and enforcement. Chapter 1 of the *International Residential Code* is deleted in its entirety. In its place, the provisions of 12-A DCMR, Chapter 1, shall apply to the *Residential Code* and are incorporated by this reference.

101.3.3 Scope. The provisions of the *Residential Code* shall apply to the construction, *alteration*, movement, enlargement, replacement, repair, equipment, use and occupancy, location, *demolition*, and *raze* of detached one- and two-family *dwelling*s and *townhouse*s not more than three stories above *grade plane* in height with a separate means of egress and their *accessory structures*.

Exceptions:

1. Live/work units complying with the requirements of Section 419 of the *Building Code* shall be allowed to be built as one- and two-family *dwelling*s or *townhouse*s. Fire suppression required by Section 419.5 of the *Building Code*, when a unit is constructed under the *Residential Code*, shall conform to Section 2904 of the *Residential Code*.
2. Owner-occupied lodging houses with five or fewer guestrooms shall be permitted to be constructed in accordance with the *Residential Code* when equipped with a fire sprinkler system that is in accordance with Section 2904 of the *Residential Code*.
3. Detached one- and two-family *dwelling*s and *townhouse*s not more than three stories above *grade plane* in height with a separate means of egress, and their *accessory structures*, shall be permitted to comply with the *Building Code* as defined in Section 101.2.
4. Existing buildings undergoing repair, alteration, change of occupancy, addition to or relocation shall comply with the *Existing Building Code* defined in Section 101.4.8 or the current *Construction Codes*.

101.3.3.1 Home day care. Appendix M of the *Residential Code* shall apply to home day care, including Child Development Homes where oversight is provided by the Office of the State Superintendent of Education or a successor agency, in *dwelling units* within either of the following:

1. Detached one- and two-family *dwelling*s or *townhouse*s within the scope of the *Residential Code*.
2. Group R-3 *dwelling*s.

101.3.4 Intent. The purpose of the *Residential Code* is to establish the minimum requirements to provide a reasonable level of safety, public health and general welfare through affordability, structural strength, means of egress facilities, stability, sanitation, adequate light and ventilation, energy and resource conservation, and safety to life and property from fire and other hazards attributed to the built environment, and to provide a reasonable level of safety to fire fighters and emergency responders during emergency operations.

101.4. Electrical Code. The *District of Columbia Electrical Code* (2017) (*Electrical Code*) shall consist of the 2014 edition of the *National Electrical Code* (*National Electrical Code*) published by the National Fire Protection Association (NFPA), as amended by the Electrical Code Supplement of 2017 (12-C DCMR) of the *District of Columbia Construction Codes Supplement of 2017*.

101.4.1. Annexes. Provisions in the annexes to the *National Electrical Code* are provided for informational purposes only, in accordance with Article 90, Section 90.5 of the *National Electrical Code*, unless otherwise specified in the *Construction Codes Supplement*.

101.4.2 Administration and enforcement. The provisions of 12-A DCMR, Chapter 1, shall apply to the *Electrical Code* and are incorporated by this reference, without deletion of Article 90 of the *National Electrical Code* except as specified.

Exceptions: Sections 90.1(A), 90.1(C), 90.2, 90.4 and 90.6 of Article 90 of the *National Electrical Code* are deleted in their entirety.

101.4.3 Scope. The provisions of the *Electrical Code* shall apply to the design, installation, maintenance, alteration, conversion, changing, repairing, removal and inspection of electrical conductors, equipment and raceways; signaling and communications conductors, equipment and raceways; and optical fiber cables and raceways for the following:

1. Public and private *premises*, including, but not limited to, *buildings*, other *structures*, mobile homes, recreational vehicles, and floating *buildings*.
2. Yards, lots, parking lots, carnivals, circuses, fairs and similar events, and industrial substations.
3. Installation of conductors and equipment that connect to the supply of electricity.
4. Installations used by the electric utility, such as office *buildings*, warehouses, garages, machine

shops, and recreational *buildings*, that are not an integral part of a generating plant, substation, or control center.

Exceptions:

1. Installations in ships, watercraft other than floating *buildings*, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles.
2. Installations underground in mines and self-propelled mobile surface mining machinery and its attendant electrical trailing cable.
3. Installation of railways for generation, transformation, transmission, or distribution of power used exclusively for operation of rolling stock or installations used exclusively for signaling and communications purposes.
4. Installations of communications equipment under the exclusive control of communications utilities located outdoors or in *building* spaces used exclusively for such installations.
5. Installations under the exclusive control of an electrical utility where such installations:
 - 5.1. Consist of service drops or service laterals, and associated metering.
 - 5.2. Are on property owned or leased by the electric utility for the purpose of communications, metering, generation, control, transformation, transmission or distribution of electric energy.
 - 5.3. Are located in legally established easements or rights-of-way.
 - 5.4. Are located by other written agreements either designated by or recognized by public service commissions, utility commissions or other regulatory agencies having jurisdiction for such installations. These written agreements shall be limited to installations for the purpose of communications, metering, generation, control, transformation, transmission, or distribution of electrical energy where legally established easements or rights-of-way cannot be obtained. These installations shall be limited to federal lands, Native American reservations through the US Department of the Interior, Bureau of Indian Affairs, military bases, lands controlled by port authorities and state agencies and *departments*, and lands owned by railroads.
6. Installations that are part of detached one- and two-family *dwellings* and *townhouses* not more than three stories above grade plane in height with separate means of egress and their accessory *structures* that comply with the *Residential Code*.

101.4.4 Intent. The purpose of the *Electrical Code* is to establish minimum requirements to safeguard persons and property from hazards arising from the use of electricity, and is not intended as a design specification or as an instruction manual for untrained persons.

101.5 Fuel Gas Code. The *District of Columbia Fuel Gas Code* (2017) (*Fuel Gas Code*) shall consist of the 2015 edition of the *International Fuel Gas Code*, as amended by the Fuel Gas Code Supplement of 2017 (12-D DCMR) of the *District of Columbia Construction Codes Supplement of 2017*.

101.5.1 Appendices. Provisions in the appendices of the *International Fuel Gas Code* shall not apply unless specifically adopted in the *Construction Codes Supplement*.

101.5.2 Administration and enforcement. Chapter 1 of the *International Fuel Gas Code* is deleted in its entirety. In its place, the provisions of 12-A DCMR, Chapter 1, shall apply to the *Fuel Gas Code* and are incorporated by this reference.

101.5.3 Scope. The provisions of the *Fuel Gas Code* shall apply to the installation of fuel gas piping systems, fuel gas utilization equipment, gaseous hydrogen systems and related accessories, as follows:

1. Gaseous hydrogen systems shall be regulated by Chapter 7.
2. The regulations shall cover piping systems for natural gas with an operating pressure of 125 pounds per square inch gauge (psig) (862 kPa gauge) or less, and for LP-gas with an operating pressure of 20 psig (140 kPa gauge) or less, except as provided in Section 402.6.1. Coverage shall extend from the point of delivery to the outlet of the equipment shutoff valves. Piping system requirements shall include design, materials, components, fabrication, assembly, installation, testing, inspection, operation and maintenance.
3. Requirements for gas utilization equipment and related accessories shall include installation, combustion and dilution air, and venting and connection to piping systems.
4. The requirements for the design, installation, maintenance, alteration and inspection of mechanical appliances operating with fuels other than fuel gas shall be regulated by the *Mechanical Code*.

Exception: Detached one- and two-family *dwellings* and *townhouses* not more than three stories above grade plane in height with separate means of egress and their accessory *structures* that comply with the *Residential Code*.

101.5.3.1 Exempted installations and equipment. The *Fuel Gas Code* shall not apply to the following:

1. Portable LP-gas equipment of all types that is not connected to a fixed fuel system.

2. Installation of farm equipment such as brooders, dehydrators, dryers and irrigation equipment.
3. Raw material (feedstock) applications, except for piping to special atmosphere generators.
4. Oxygen-fuel gas cutting and welding systems.
5. Industrial gas applications using gases such as acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen and nitrogen.
6. Petroleum refineries, pipeline compressor or pumping stations, loading terminals, compounding plants, refinery tank farms and natural gas processing plants.
7. Integrated chemical plants or portions of such plants where flammable or combustible liquids or gases are produced by chemical reactions or used in chemical reactions.
8. LP-gas installations at utility gas plants.
9. Liquefied natural gas (LNG) installations.
10. Fuel gas piping in power and atomic energy plants.
11. Proprietary items of equipment, apparatus, or instruments such as gas generating sets, compressors and calorimeters.
12. LP-gas equipment for vaporization, gas mixing and gas manufacturing.
13. Temporary LP-gas piping for *buildings* under construction or renovation that is not to become part of the permanent piping system.
14. Installation of LP-gas systems for railroad switch heating.
15. Installation of LP-gas and compressed natural gas (CNG) systems on vehicles.
16. Except as provided in Section 401.1.1 of the *Fuel Gas Code*, gas piping, meters, gas pressure regulators and other appurtenances used by the serving gas supplier in the distribution of gas, other than undiluted LP-gas.
17. *Building* design and construction, except as specified herein.
18. Piping systems for mixtures of gas and air within the flammable range with an operating pressure greater than 10 psig (69 kPa gauge).
19. Portable fuel cell appliances that are neither connected to a fixed piping system nor interconnected to a power grid.

101.5.4 Intent. The purpose of the *Fuel Gas Code* is to establish minimum standards to provide a reasonable level of safety, health, property and public welfare by regulating

and controlling the design, construction, installation, quality of materials, location, operation and maintenance or use of fuel gas systems.

101.6 Mechanical Code. The *District of Columbia Mechanical Code* (2017) (*Mechanical Code*) shall consist of the 2015 edition of the *International Mechanical Code*, as amended by the Mechanical Code Supplement of 2017 (12-E DCMR) of the *District of Columbia Construction Codes Supplement of 2017*.

101.6.1 Appendices. Provisions in the appendices of the *International Mechanical Code* shall not apply unless specifically adopted in the *Construction Codes Supplement*.

101.6.2 Administration and enforcement. Chapter 1 of the *International Mechanical Code* is deleted in its entirety. In its place, the provisions of 12-A DCMR, Chapter 1, shall apply to the *Mechanical Code* and are incorporated by this reference.

101.6.3 Scope. The provisions of the *Mechanical Code* shall regulate the design, installation, maintenance, *alteration* and inspection of mechanical systems that are permanently installed and utilized to provide control of environmental conditions and related processes within *buildings*. The *Mechanical Code* shall also regulate those mechanical systems, systems components, equipment and appliances specifically addressed therein. The installation of fuel gas distribution piping and equipment, fuel gas-fired appliances and fuel gas-fired appliance venting systems shall be regulated by the *Fuel Gas Code*.

Exception: Detached one- and two-family *dwelling*s and *townhouses* not more than three stories above *grade plane* in height with separate means of egress and their accessory *structures* that comply with the *Residential Code*.

101.6.4 Intent. The purpose of the *Mechanical Code* is to establish minimum standards to provide a reasonable level of safety, health, property protection and public welfare by regulating and controlling the design, construction, installation, quality of materials, location, operation and maintenance or use of mechanical systems.

101.7 Plumbing Code. The *District of Columbia Plumbing Code* (2017) (*Plumbing Code*) shall consist of the 2015 edition of the *International Plumbing Code*, as amended by the Plumbing Code Supplement of 2017 (12-F DCMR) of the *District of Columbia Construction Codes Supplement of 2017*.

101.7.1 Appendices. Provisions in the appendices of the *International Plumbing Code* shall not apply unless specifically adopted in the *Construction Codes Supplement*.

101.7.2 Administration and enforcement. Chapter 1 of the *International Plumbing Code* is deleted in its entirety. In its place, the provisions of 12-A DCMR, Chapter 1, shall apply to the *Plumbing Code* and are incorporated by this reference.

101.7.3 Scope. The provisions of the *Plumbing Code* shall apply to the erection, installation, alteration, repairs, relo-

cation, replacement, addition to, use or maintenance of plumbing systems within the District of Columbia. The *Plumbing Code* shall also regulate nonflammable medical gas, inhalation anesthetic, vacuum piping, nonmedical oxygen systems and sanitary and condensate vacuum collection systems.

Exceptions:

1. Detached one- and two-family *dwelling*s and *townhouses* not more than three stories above *grade plane* in height with separate means of egress and their accessory *structures* that comply with the *Residential Code*.
2. The design and installation of fuel gas distribution piping and equipment, fuel gas fired water heaters and water heater venting systems shall be regulated by the *Fuel Gas Code*.
3. The design and installation of chilled water piping in connection with refrigeration process and comfort cooling, and hot water piping in connection with *building* heating, shall conform to the requirements of the *Mechanical Code*.
4. The design and installation of piping for fire sprinklers and standpipes shall conform to the requirements of the *Building Code*. Water and drainage connections to such installations shall be made in accordance with the requirements of the *Plumbing Code*.

101.7.4 Intent. The purpose of the *Plumbing Code* is to establish minimum standards to provide a reasonable level of safety, health, property protection and public welfare by regulating and controlling the design, construction, installation, quality of materials, location, operation and maintenance or use of plumbing equipment and systems.

101.8 Property Maintenance Code. The *District of Columbia Property Maintenance Code* (2017) (*Property Maintenance Code*) shall consist of the 2015 edition of the *International Property Maintenance Code* as amended by the Property Maintenance Code Supplement of 2017 (12-G DCMR) of the *District of Columbia Construction Codes Supplement of 2017*.

101.8.1 Appendices. Provisions in the appendices of the *International Property Maintenance Code* shall not apply unless specifically adopted in the *Construction Codes Supplement*.

101.8.2 Administration and enforcement. Chapter 1 of the *International Property Maintenance Code* is deleted in its entirety. Administration and enforcement provisions for the *Property Maintenance Code* are set forth in 12-G DCMR, Chapter 1.

101.8.3 Scope. The provisions of the *Property Maintenance Code* shall apply to all existing residential and non-residential *premises* and shall constitute minimum requirements and standards for: *premises*, equipment, and facilities for light, *ventilation*, space, heating, sanitation, protection from the elements, a reasonable level of safety from fire and other hazards, and for a reasonable level of sanitary maintenance; the responsibility of *owners*, *opera-*

tors and *occupants*; the *occupancy* of existing *premises*; and for administration, enforcement and penalties.

101.8.4 Intent. The purpose of the *Property Maintenance Code* is to ensure public health, safety and welfare insofar as they are affected by the continued *occupancy* and maintenance of *premises*. Existing *premises* that do not comply with these provisions shall be altered or repaired to provide a minimum level of health and safety as required therein.

101.9 Fire Code. The *District of Columbia Fire Code* (2017) (*Fire Code*) shall consist of the 2015 edition of the *International Fire Code*, as amended by the Fire Code Supplement of 2017 (12-H DCMR) of the *District of Columbia Construction Codes Supplement of 2017*.

101.9.1 Appendices. Provisions in the appendices of the *International Fire Code* shall not apply unless specifically adopted in the *Construction Codes Supplement*.

101.9.2 Administration and enforcement. Chapter 1 of the *International Fire Code* is deleted in its entirety. Administration and enforcement provisions for the *Fire Code* are set forth in 12-H DCMR, Chapter 1.

101.9.3 Scope. The provisions of the *Fire Code* shall establish regulations affecting or relating to *premises*, processes and safeguards regarding: the hazard of fire and explosion arising from the storage, handling or use of *structures*, materials or devices; conditions hazardous to life, property or public welfare in the occupancy of *premises*; fire hazards on the *premises* from occupancy or operation; and conditions affecting the safety of fire fighters and emergency responders during emergency operations.

101.9.4 Intent. The purpose of the *Fire Code* is to establish the minimum requirements consistent with nationally recognized good practice for providing a reasonable level of life safety and property protection from the hazards of fire, explosion or dangerous conditions in all *premises*, and to provide a reasonable level of safety to fire fighters and emergency responders during emergency operations.

101.10 Energy Conservation Code. The *District of Columbia Energy Conservation Code* (2017) (*Energy Conservation Code*) shall consist of the *Energy Conservation Code—Commercial Provisions* and the *Energy Conservation Code—Residential Provisions*. The *Energy Conservation Code—Commercial Provisions* shall consist of ANSI/ASHRAE/IES 90.1—2013, Energy Standard for Buildings Except Low-Rise Residential Buildings (ASHRAE 90.1), as amended by the Energy Conservation Code Supplement of 2017—Commercial Provisions (12-I[CE] DCMR) of the *District of Columbia Construction Codes Supplement of 2017*. The *Energy Conservation Code—Residential Provisions* shall consist of the Residential Provisions of the 2015 edition of the *International Energy Conservation Code*, as amended by the Energy Conservation Code Supplement of 2017—Residential Provisions (12-I[RE] DCMR) of the *District of Columbia Construction Codes Supplement of 2017*.

101.10.1 Appendices. Provisions in the appendices to the *Energy Conservation Code—Commercial Provisions* shall not apply unless specifically adopted in the *Construction*

Codes Supplement. The *Energy Conservation Code—Residential Provisions* has no appendices.

101.10.1.1 Normative and Informative Appendices. Normative Appendices A, B, C, D and G of ASHRAE 90.1, as amended by the Energy Conservation Code Supplement, are adopted in the District of Columbia as an integral part of the mandatory requirements of the *Energy Conservation Code—Commercial Provisions*, which, for reasons of convenience are placed apart from all other normative elements. Informative Appendices E and F of ASHRAE 90.1 and informative notes located within the *Energy Conservation Code—Commercial Provisions* contain additional information and are not mandatory requirements.

101.10.1.2 Appendix Z. Appendix Z to the *Energy Conservation Code—Commercial Provisions* provides an alternative compliance path. See Section 101.10.6.

101.10.2 Administration and enforcement. Sections 1, 2 and 4 of ASHRAE 90.1 and Chapter 1 [RE] of the *International Energy Conservation Code* are deleted in their entirety. In their place, the provisions of 12-A DCMR, Chapter 1, shall apply to the *Energy Conservation Code* and are incorporated by this reference.

101.10.3 Scope and general requirements.

101.10.3.1 Scope. The *Energy Conservation Code* shall apply to *commercial buildings*, *residential buildings* and the *buildings'* sites and associated systems and equipment.

Exceptions:

1. **Existing buildings.** Except as specified in 12-A DCMR, Chapter 1, the *Energy Conservation Code* shall not be used to require the removal, alteration or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of the *Energy Conservation Code*.
2. **Historic buildings.** Provisions of the *Energy Conservation Code* relating to the construction, repair, alteration, restoration and movement of structures, and change of occupancy shall not be mandatory for *historic buildings* provided that a report has been submitted to the *code official* and signed by the owner, or a registered *design professional*, or a certification has been submitted to the *code official* and signed by the State Historic Preservation Office, demonstrating that compliance with that provision would threaten, degrade or destroy the historic form, fabric or function of the *building*.
3. **Low energy buildings.** The following *buildings*, or portions thereof, separated from the remainder of the *building* by building thermal envelope

assemblies complying with the *Energy Conservation Code* shall be exempt from the building thermal envelope provisions of the *Energy Conservation Code*:

- a. *Buildings*, or portions thereof, with a peak design rate of energy usage less than 3.4 Btu/h • ft² (10.7 W/m²) or 1.0 watt/ft² (10.7 W/m²) of floor area for space conditioning purposes.
- b. *Buildings*, or portions thereof, that do not contain conditioned space.
4. Where the commercial building project complies with one of the alternative compliance paths set forth in Section 101.10.6.
5. Where the residential building project complies with one of the alternative compliance paths set forth in Section 101.10.7.

101.10.4 Intent. The *Energy Conservation Code* shall regulate the design and construction of *buildings* for the effective use and conservation of energy over the useful life of each *building*. The *Energy Conservation Code* is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. The *Energy Conservation Code* is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

101.10.5 Compliance. *Residential buildings* shall meet the provisions of the *Energy Conservation Code—Residential Provisions*. *Commercial buildings* shall meet the provisions of the *Energy Conservation Code—Commercial Provisions*.

101.10.5.1 Mixed occupancy. Where a *building* includes both *residential* and *commercial* occupancies, each occupancy shall be separately considered and meet the applicable provisions of the *Energy Conservation Code—Commercial Provisions* or the *Energy Conservation Code—Residential Provisions*.

101.10.5.2 Compliance materials. The *code official* is authorized to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of the *Energy Conservation Code*.

101.10.6 Alternative compliance paths for commercial building projects. In lieu of the requirements of the *Energy Conservation Code—Commercial Provisions*, *commercial building* projects that comply with one of the alternative compliance paths set forth in Sections 101.10.6.1 through 101.10.6.7 shall be deemed to comply with the *Energy Conservation Code—Commercial Provisions*.

101.10.6.1 Appendix Z. Demonstrate compliance with all sections of Appendix Z, with the exception of Section Z5.2 of the *Energy Conservation Code—Commercial Provisions*.

101.10.6.2 Compliance utilizing ILFI Living Building Challenge. Design, construct and certify to the International Living Future Institute's (ILFI) Living Building Challenge program for either full Living Building Challenge or Energy Petal certification. The *owner* shall provide documentation to the *code official* confirming registration with the Living Building Challenge program prior to permit issuance. The *owner* shall have an 18-month period from the date of issuance of the first certificate of occupancy, or from approval of the final inspection, to submit official evidence of certification to the *code official*. The *code official*, for good cause and upon written request, is authorized to extend the period to submit evidence of certification.

101.10.6.3 Compliance utilizing ILFI Zero Energy Building. Design, construct and certify to the International Living Future Institute's (ILFI) Net Zero Energy Building Certification. The *owner* shall provide documentation to the *code official* confirming registration with the Net Zero Energy program prior to permit issuance. The *owner* shall have an 18-month period from the date of issuance for the project of the certificate of occupancy, or from approval of the final inspection, to submit official evidence of certification to the *code official*. The *code official*, for good cause and upon written request, is authorized to extend the period to submit evidence of certification.

101.10.6.4 Compliance utilizing PHIUS+ and on-site solar. Design, construct and certify to the Passive House Institute United States' (PHIUS)+ program. The *owner* shall have an 18-month period from the date of issuance of the certificate of occupancy for the project, or from approval of the final inspection, to submit official evidence of certification by the PHIUS+ program to the *code official*. The *code official*, for good cause and upon written request, is authorized to extend the period to submit evidence of certification. Additionally, the *owner* must install a solar PV system on the building's roof that offsets the annual net energy use.

101.10.6.5 Compliance utilizing PHI and on-site solar. Design, construct and certify to the Passive House Institute (PHI) program. The *owner* shall have an 18-month period from the date of issuance for the project of the certificate of occupancy, or from approval of the final inspection, to submit official evidence of certification by the PHI program to the *code official*. The *code official*, for good cause and upon written request, is authorized to extend the period to submit evidence of certification. Additionally, the *owner* must install a solar PV system on the building's roof that offsets the annual net energy use.

101.10.6.6 Compliance utilizing LEED and LEED Zero Carbon. Design, construct, and certify to the LEED Rating System and LEED Zero Carbon Rating System. The *owner* shall provide *approved* documentation to the *code official*, prior to permit issuance, (1)

confirming registration with the LEED Rating System programs, and (2) an approved pre-construction energy model that is consistent with achieving LEED Zero Carbon certification. Additionally, the *owner* must complete "Enhanced Commissioning" requirements during construction. The *owner* shall have an 18-month period from the date of issuance of the certificate of occupancy, or from approval of the final inspection, whichever is later, to submit official evidence of certification to both LEED and LEED Zero Carbon to the *code official*.

101.10.6.7 Compliance utilizing LEED and LEED Zero Energy. Design, construct and certify to the LEED Rating System and LEED Zero Energy Rating System. The *owner* shall provide *approved* documentation to the *code official*, prior to permit issuance, (1) confirming registration with the LEED Rating System programs, and (2) an approved pre-construction energy model that is consistent with achieving LEED Zero Energy certification. Additionally, the *owner* must complete "Enhanced Commissioning" requirements during construction. The *owner* shall have an 18-month period from the date of issuance for the project of the certificate of occupancy, or from approval of the final inspection, whichever is later, to submit official evidence of certification to both LEED and LEED Zero Energy to the *code official*.

101.10.7 Alternative compliance paths for residential buildings In lieu of the requirements of the *Energy Conservation Code—Residential Provisions*, *residential building* projects that comply with one of the alternative compliance paths set forth in Sections 101.10.7.1 through 101.10.7.9 shall be deemed to comply with the *Energy Conservation Code—Residential Provisions*.

101.10.7.1 Compliance utilizing ERI. Design and construct to an Energy Rating Index (ERI) of "0" in accordance with Section R406 of the *Energy Conservation Code—Residential Provisions*. Verify compliance at the completion of construction in accordance with guidance given by the *code official*.

101.10.7.2 Compliance utilizing DCRA Residential Net-Zero Energy Program. Achieve compliance with the requirements of DCRA's Residential Net-Zero Energy Program as set forth in an administrative bulletin.

101.10.7.3 Compliance utilizing ILFI Living Building Challenge. Design, construct and certify to the International Living Future Institute's Living Building Challenge program for either full Living Building Challenge or Energy Petal certification. The *owner* shall provide documentation to the *code official* confirming registration with the Living Building Challenge program prior to permit issuance. The *owner* shall have an 18-month period from the date of issuance of the first certificate of occupancy, or from approval of the final inspection, to submit official evidence of certification to the *code official*. The *code official*, for good

cause and upon written request, is authorized to extend the period to submit evidence of certification.

101.10.7.4 Compliance utilizing ILFI Zero Energy Building Certification. Design, construct and certify to the International Living Future Institute's Zero Energy Building Certification. The owner shall provide documentation to the *code official* confirming registration with the Zero Energy Building program prior to permit issuance. The owner shall have an 18-month period from the date of issuance for the project of the certificate of occupancy, or from approval of the final inspection, to submit official evidence of certification to the *code official*. The *code official*, for good cause and upon written request, is authorized to extend the period to submit evidence of certification.

101.10.7.5 Compliance utilizing the DOE Zero Energy Ready Home and on-site solar. Design, construct and certify to the standards of the Zero Energy Ready Home program of the United States Department of Energy (DOE). The owner shall have an 18-month period from the date of issuance of the certificate of occupancy, or from approval of the final inspection, to submit official evidence of certification to the *code official*. The *code official*, for good cause and upon written request, is authorized to extend the period to submit evidence of certification. Additionally, the owner must install a solar PV system on the roof that offsets the annual net energy use of the home.

101.10.7.6 Compliance utilizing PHIUS+ and on-site solar. Design, construct and certify to the Passive House Institute United States' PHIUS+ program. The owner shall have an 18-month period from the date of issuance of the certificate of occupancy, or approval of the final inspection, to submit official evidence of certification to the *code official*. The *code official*, for good cause and upon written request, is authorized to extend the period to submit evidence of certification. Additionally, the owner must install a solar PV system on the roof that offsets the annual net energy use of the home.

101.10.7.7 Compliance utilizing PHI and on-site solar. Design, construct and certify to the Passive House Institute program. The owner shall have an 18-month period from the date of issuance of a certificate of occupancy or from approval of the final inspection, whichever is later, to submit official evidence of certification by the PHI program to the *code official*. The *code official*, for good cause and upon written request, is authorized to extend the period to submit evidence of certification. Additionally, the owner must install a solar PV system on the roof that offsets the annual net energy use of the home.

101.10.7.8 Compliance utilizing LEED and LEED Zero Carbon. Design, construct and certify to the LEED for Homes or LEED for Homes Midrise Rating Systems, and LEED Zero Carbon Rating System. The owner shall provide *approved* documentation to the *code official*, prior to permit issuance, (1) confirming

registration with the LEED rating system programs, and (2) an *approved* pre-construction energy model that is consistent with achieving LEED Zero Carbon certification. The owner shall have an 18-month period from the date of issuance of a certificate of occupancy for the project or from the date of final inspection approval, whichever is later, to submit official evidence of certification by both LEED and LEED Zero Carbon to the *code official*.

101.10.7.9 Compliance utilizing LEED and LEED Zero Energy. Design, construct and certify to the LEED for Homes or LEED for Homes Midrise Rating Systems, and LEED Zero Energy Rating System. The owner shall provide *approved* documentation to the *code official*, prior to permit issuance, (1) confirming registration with the LEED rating system programs, and (2) an approved pre-construction energy model that is consistent with achieving LEED Zero Energy certification. The owner shall have an 18-month period from the date of issuance of a certificate of occupancy for the project or from approval of the final inspection, whichever is later, to submit official evidence of certification by both LEED and LEED Zero Energy to the *code official*.

101.11 Existing Building Code. The *District of Columbia Existing Building Code* (2017) (*Existing Building Code*) shall consist of the 2015 edition of the *International Existing Building Code*, as amended by the Existing Building Code Supplement of 2017 (12-J DCMR) of the *District of Columbia Construction Codes Supplement of 2017*.

101.11.1 Appendices. Provisions in the appendices of the *International Existing Building Code* shall not apply unless specifically adopted in the *Construction Codes Supplement*.

101.11.2 Administration and enforcement. Chapter 1 of the *International Existing Building Code* is deleted in its entirety. In its place, the provisions of 12-A DCMR, Chapter 1, shall apply to the *Existing Building Code* and are incorporated by this reference.

101.11.3 Scope. The provisions of the *Existing Building Code* shall apply to the repair, alteration, change of occupancy, or relocation of, or addition to, existing buildings, including existing buildings under the jurisdiction of the *Residential Code*.

101.11.3.1 Residential Code references. In the *Existing Building Code*, all references to Group R occupancies in general, or Group R-3 in particular, shall also refer to any existing building or existing structure under the jurisdiction of the *Residential Code*.

101.11.3.2 Residential Code applicability. In the *Existing Building Code*, for buildings regulated by the *Residential Code*, references to the *Building Code* shall refer to the *Residential Code*.

101.11.4 Intent. The purpose of the *Existing Building Code* is to provide the *code official* with flexibility to permit the use of alternative approaches to achieve compliance with minimum requirements to safeguard the public

health, safety and welfare, insofar as they are affected by the repair, alteration, change of occupancy, addition or relocation of *existing buildings*.

101.12 Green Construction Code. The *District of Columbia Green Construction Code* (2017) (*Green Construction Code*) shall consist of the 2012 edition of the *International Green Construction Code*, as amended by the Green Construction Code Supplement of 2017 (12-K DCMR) of the *District of Columbia Construction Codes Supplement of 2017*.

101.12.1 Appendices. Provisions in the appendices of the *International Green Construction Code* shall not apply unless specifically adopted in the *Construction Codes Supplement*.

101.12.2 Administration and enforcement. Chapter 1 of the *International Green Construction Code* is deleted in its entirety. In its place, the provisions of 12-A DCMR, Chapter 1, shall apply to the *Green Construction Code* and are incorporated by this reference.

101.12.3 Scope. The provisions of the *Green Construction Code* shall apply to the construction, *addition*, *alteration*, *relocation*, *demolition*, and *razing* of every *building* or *structure* and appurtenances connected or attached to such *buildings* or *structures* and to the site on which the *building* or *structure* is located except as otherwise provided in this section or in the *Green Construction Code*.

Exceptions:

1. The *Green Construction Code* shall not apply to the following:
 - a. *Demolition* or *razing* of a *building* or *structure* of less than 10,000 square feet (929 m²), unless associated with a new construction, an addition, and/or site work of 10,000 square feet or more (929 m²).
 - b. New construction and associated building site development, including construction of an *addition* to an *existing building*, of less than 10,000 square feet (929 m²).
 - c. *Alteration* of an *existing building* where the aggregate area of construction or renovation is less than 10,000 square feet.
 - d. Relocation of *structures* of less than 10,000 square feet (929 m²).
2. The *Green Construction Code* shall not apply to the following residential construction:
 - a. Detached one- and two-family *dwelling*s and multiple single-family *dwelling*s (*townhouses*) not more than three stories in height above *grade plane* with a separate means of egress, their accessory *structures* and the site or lot upon which these *buildings* are located.
 - b. Group R-3 residential *buildings*, their accessory *structures* and the site or lot upon which these *buildings* are located.
3. The *Green Construction Code* shall not be deemed to require the removal, alteration or abandonment of, nor prevent the continued use and maintenance of, an existing *building*, building system or building component lawfully in existence at the time of adoption of the *Green Construction Code*, unless within the work area of an alteration as defined in Section 101.12.3.1.
 - a. The *Green Construction Code* shall not apply to equipment or systems that are used primarily for industrial or manufacturing.
 - b. The *Green Construction Code* shall not apply to temporary *structures* approved under Sections 107 and 3103 of the *Building Code*.
 - c. Appendix A to the *Green Construction Code* shall not apply to *alterations* except for Level 3 *alterations*, or Level 2 *alterations* 50,000 square feet (4645 m²) and larger where 10,000 square feet (929 m²) of the space is being reconfigured.
 - d. Appendix A to the *Green Construction Code* shall not apply to first time tenant fit-outs except for first time tenant fit-outs 10,000 square feet (929 m²) and larger.
4. The *Green Construction Code* shall not apply where a project is within the scope of the Green Building Act of 2006, effective March 8, 2007 [DC Law 16-234; DC Official Code §§ 6-1451.01 *et seq.* (2018 Repl.)], as amended (Green Building Act), and the project complies with the provisions of the Green Building Act and the regulations promulgated thereunder set forth in Section 302 of the *Green Construction Code*.
5. The *Green Construction Code* shall not apply where a project complies with one of the alternative compliance paths set forth in Section 101.12.5.

101.12.3.1 Applicability to alteration. Determination of whether the area threshold would be triggered by an *alteration* of an *existing building* shall be based upon the aggregate area affected by the *alteration*; the work area where the *alteration* is to take place shall be identified in the permit application. An *alteration* includes, but is not limited to, fit out of space in an *existing building* not previously built out and fit out of space following demolition of previously built out space in an *existing building*. Areas of an *existing building* beyond the work area of an *alteration* shall not be included to determine if the *Green Construction Code* would be applicable to the *alteration*. Notwithstanding a determination that the size of the work area of an *alteration* would subject the *alteration* to the provisions of the *Green Construction Code*, compliance with the *Green Construction Code* shall not be required for building areas, components and systems that are located outside of the affected work area of the *alteration*.

101.12.3.2 Applicability to additions. Only the aggregate area of a proposed *addition* to an *existing building* shall be used to determine if the provisions of the *Green Construction Code* would be applicable to the work to be undertaken to construct the *addition*. The portion(s) of an *existing building* that would not be altered by the construction of the *addition* shall not be used to determine if the threshold for application of the *Green Construction Code* would be met. If the provisions of the *Green Construction Code* would be applicable to the construction of an *addition*, then only the work to be undertaken in the *addition* shall be subject to the provisions of the *Green Construction Code*; the portion(s) of an *existing building*, *building* components or *building* systems located outside of the *addition* are not required to be brought into compliance with the provisions of the *Green Construction Code*.

101.12.4 Intent. The *Green Construction Code* is intended to safeguard the environment, public health, safety and general welfare through the establishment of requirements to reduce the negative impacts and increase the positive impacts of the built environment on the natural environment and *building* occupants. The *Green Construction Code* is not intended to abridge or supersede safety, health or environmental requirements under other applicable codes or ordinances.

101.12.5. Alternative compliance paths. In lieu of the requirements of the *Green Construction Code*, projects that comply with one of the alternative compliance paths set forth in Sections 101.12.5.1 through 101.12.5.4. shall be deemed to comply with the *Green Construction Code*.

101.12.5.1 Compliance utilizing Living Building Challenge. Projects designed, constructed and certified to be in compliance with the International Living Future Institute's Living Building Challenge standard listed in Chapter 35 shall be deemed to comply with the *Green Construction Code*. The *owner* shall have an 18-month period from the date of issuance for the project of the certificate of occupancy, or the first certificate of occupancy for occupiable space in a *story above grade plane* where a project has multiple certificates of occupancy, to submit evidence of Living Building Challenge certification to the *code official*. The *code official*, for good cause and upon written request, is authorized to extend the period to submit evidence of certification.

101.12.5.2 Compliance utilizing LEED. Projects designed, constructed and certified to be in compliance with one or more of the US Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) standards listed in Chapter 35 at the Certified Level or higher shall be deemed to comply with the *Green Construction Code*. The *owner* shall have a 12-month period from the date of issuance for the project of the certificate of occupancy, or the first certificate of occupancy for occupiable space in a *story above grade plane* where a project has multiple certificates of occupancy, to submit evidence of LEED certification to the *code official*. The *code official*, for good

cause and upon written request, is authorized to extend the period to submit evidence of certification. Projects utilizing the LEED alternative compliance path shall also certify using either the EPA's Energy Star New Homes Program or Multifamily High Rise Program, as applicable.

101.12.5.3 Compliance utilizing Green Communities. Affordable housing in Group R-2 occupancies designed, constructed and certified to be in compliance with the Enterprise Community Partners standard listed in Chapter 35 shall be deemed to comply with the *Green Construction Code*. The *owner* shall have a 12-month period from the date of issuance for the Group R-2 occupancy of the certificate of occupancy, or the first certificate of occupancy for occupiable space in a *story above grade plane* where a project has multiple certificates of occupancy, to submit certification of compliance with the applicable Enterprise Community Partners standard to the *code official*. The *code official*, for good cause and upon written request, is authorized to extend the period to submit evidence of certification. Affordable housing for the purpose of this section shall consist of projects eligible for certification by Enterprise Community Partners or as otherwise defined by the *code official*. New construction projects utilizing the Energy Enterprise Green Communities alternative compliance path shall also certify using either the EPA's Energy Star New Homes Program or Multifamily High Rise Program, as applicable.

101.12.5.4 Compliance utilizing National Green Building Standard (ICC 700). Group R-2 occupancies designed, constructed and certified to be in compliance with: (a) the National Green *Building Standard*, ICC 700, listed in Chapter 35, at the bronze level or higher; and (b) the EPA's Energy Star New Homes Program or Multifamily High Rise Program, as applicable, listed in Chapter 35, shall be deemed to comply with the *Green Construction Code*. The *owner* shall have a 12-month period from the date of issuance for the Group R-2 occupancy of the certificate of occupancy, or the first certificate of occupancy for occupiable space in a *story above grade plane* where a project has multiple certificates of occupancy, to submit evidence of certification to the *code official*. The *code official*, for good cause and upon written request, is authorized to extend the period to submit evidence of certification.

101.13 Swimming Pool and Spa Code. The *District of Columbia Swimming Pool and Spa Code* (2017) (*Swimming Pool and Spa Code*) shall consist of the 2015 edition of the *International Swimming Pool and Spa Code*, as amended by the *Swimming Pool and Spa Code Supplement of 2017* (12-L DCMR) of the *District of Columbia Construction Codes Supplement of 2017*.

101.13.1 Appendices. Provisions in the appendices of the *International Swimming Pool and Spa Code* shall not apply unless specifically adopted in the *Construction Codes Supplement*.

101.13.2 Administration and enforcement. Chapter 1 of the *International Swimming Pool and Spa Code* is deleted

in its entirety. In its place, the provisions of 12-A DCMR, Chapter 1, shall apply to the *Swimming Pool and Spa Code* and are incorporated by this reference.

101.13.3 Scope. The provisions of the *Swimming Pool and Spa Code* shall apply to the construction, alteration, movement, renovation, replacement, repair and maintenance of aquatic recreation facilities, pools and spas. The pools and spas covered by the *Swimming Pool and Spa Code* are either permanent or temporary, and shall be only those that are designed and manufactured to be connected to a circulation system and that are intended for swimming, bathing or wading.

101.13.4 Intent. The purpose of the *Swimming Pool and Spa Code* is to establish minimum standards to provide a reasonable level of safety and protection of health, property and public welfare by regulating and controlling the design, construction, installation, quality of materials, location and maintenance or use of pools and spas.

101.13.5 Applicability. Any pool or spa and related mechanical, electrical and plumbing systems lawfully in existence at the time of the adoption of the *Swimming Pool and Spa Code* shall be permitted to have their use and maintenance continued if the use, maintenance or repair is in accordance with the original design and no hazard to life, health or property is created. Additions, alterations, renovations or repairs to any pool, spa or related system shall conform to the requirements for a new system without requiring the existing systems to comply with the requirements of the *Swimming Pool and Spa Code* provided that such systems were lawfully in existence at the time of the adoption of the *Swimming Pool and Spa Code*.

101.13.5.1 Moved pools and spas. Unless covered by Section 101.13.5, systems that are a part of a pool, spa or system moved indoor within the District of Columbia shall comply with the provisions of the *Swimming Pool and Spa Code* for new installations.

101.13.6 Other requirements. Owners and operators of swimming pools and spas shall also comply with the requirements of other District government agencies, including the Department of Health (DOH) regulations set forth in 25-C DCMR, Chapter 64, and the District Department of the Environment (DDOE) regulations set forth in 21 DCMR, Chapter 5.

101.14 Jurisdiction. The *Construction Codes* shall apply to *premises* within the limits of the District of Columbia, including *premises* owned, occupied or controlled by the Government of the District of Columbia or any of its independent agencies.

101.14.1 Federal premises. Except as set forth in Section 101.14.1.1, the *Construction Codes* shall not apply to *premises* owned by the United States of America. *Premises* under the exclusive control of an officer of the United States government in his or her official capacity shall be deemed to be owned by the United States of America for purposes of this section, provided that the *premises* shall not be deemed to be under the exclusive control of an officer of the United States government where: (a) the *premises* (or any portions thereof) are leased to the United

States of America, but the lessor is responsible for maintenance and repairs to the leased *premises*; or (b) the *premises* are owned by the United States of America, but leased to a *person* or *persons* other than the United States of America for development pursuant to a long-term ground lease or comparable property interest.

101.14.1.1 Applicability of environmental laws and regulations. Notwithstanding Section 101.14.1, and even where the *Construction Codes* may not otherwise apply to a particular project, a permit in accordance with Section 105.1 is required for (1) major substantial improvement activities (as defined in 21 DCMR, Chapter 5) or (2) land-disturbing activities involving the implementation of stormwater management, erosion and sediment control, or floodplain management measures, and to the extent required by, 21 DCMR, Chapter 5; 20 DCMR, Chapter 31; or the Soil Erosion and Sedimentation Control Amendment Act of 1994, effective August 26, 1994 [DC Law 10-166; DC Official Code § 6-1403 (2018 Repl.)].

101.14.2 Foreign missions. The *Construction Codes* shall apply to those *buildings* occupied by or for any foreign government as an embassy or chancery to the extent provided for in Section 206 of the Foreign Missions Act, approved August 24, 1982 [96 Stat. 286; DC Official Code § 6-1306(g) (2018 Repl.)], that is, foreign missions shall substantially comply with the *Construction Codes* as required by the US Secretary of State in a manner determined by the Secretary not to be inconsistent with the international obligations of the United States. Notwithstanding the foregoing, a permit shall be required for all land-disturbing activities or major substantial improvement activities as defined by 21 DCMR, Chapter 5.

101.14.3 President or Vice President's residence. No permit required under the *Construction Codes* shall be issued if it is determined by the *code official*, defined in Section 103.1 of the *Building Code*, that:

1. The permit affects an area in close proximity to the official residence of the President or Vice President of the United States as close proximity is determined by the United States; and
2. The United States Secret Service has established that the issuance of the permit would adversely impact the safety and security of the President or the Vice President of the United States.

101.14.4 Structures located in or adjacent to rivers or bodies of water. The *Construction Codes* shall apply to *structures*, including, but not limited to, piers, wharves, jetties, slips, boat storage facilities, marinas and pilings located in or adjacent to any river or body of water within the limits of the District of Columbia, pursuant to An Act Relative to the control of wharf property and certain public spaces in the District of Columbia, approved March 3, 1899 [30 Stat. 1377; DC Official Code § 10-501.01 (2013 Repl.)]. Notwithstanding the foregoing, work affecting navigable waters may also require a permit from the US Army Corps of Engineers pursuant to the Rivers and Har-

bors Appropriation Act of 1899, effective March 3, 1899 [30 Stat. 1151; 33 USC § 401 (2007)].

SECTION 102 APPLICABILITY

102.1 General. The provisions of these regulations shall cover all matters affecting or relating to *buildings*, other *structures* and systems as set forth in Section 101. A *building* or other *structure* shall not be constructed, maintained, extended, repaired, removed or altered in violation of these provisions.

Exception: The raising, lowering, or moving of a *building* or other *structure* as a unit, necessitated by a change in legal grade or widening of a street, shall be permitted provided that the *building* or other *structure* is not otherwise altered, that its use or occupancy is not changed, and that the *building* or other *structure* complies with the code provisions originally applicable to the *building* or other *structure*.

102.1.1 Code precedence. Unless otherwise provided herein, or in the *Construction Codes Act*, the *Construction Codes* shall take precedence over the *Construction Codes Act*, and the *Construction Codes Supplement* shall take precedence over the Model Codes (as defined in Section 101.1), including standards and amendments.

No provision of the *Construction Codes* shall be deemed to modify or amend any provision of the *Zoning Regulations* of the District of Columbia (11 DCMR), as amended, or any relief granted or order issued pursuant thereto (collectively, the *Zoning Regulations*), nor shall any provision of those *Zoning Regulations* be deemed to modify or amend any provision of the *Construction Codes*. Where a provision of the *Construction Codes* is deemed to be in conflict with any provision of the *Zoning Regulations*, then a waiver of the applicable provision of the *Construction Codes* must be sought from the *code official*, or there must be relief granted pursuant to the applicable provisions of the *Zoning Regulations* by the *Board of Zoning Adjustment* or as otherwise provided therein.

102.1.2 Conflicts. Where, in any specific case, different sections of the *Construction Codes* specify different materials, methods of construction or other requirements, the most restrictive shall govern. When there is a conflict between a general requirement and a specific requirement within the *Construction Codes*, the specific requirement shall be applicable.

102.2 Performance of work in public space. Work performed in public space, not specifically addressed in the *Construction Codes*, shall conform to the pertinent standards and permitting requirements of the District of Columbia Department of Transportation (DDOT) and of the District of Columbia Water and Sewer Authority (DC Water). *See*, for example, 24 DCMR; DC Official Code, Title 10, Chapter 11; 21 DCMR; DC Official Code § 8-205.

102.3 Application of references. Unless otherwise specifically provided in the *Construction Codes*, all references to article or section numbers, or to provisions not specifically

identified by number, shall be construed to refer to such article, section or provision of the *Construction Codes*.

102.4 Referenced Standards. The standards referenced in the *Construction Codes* and listed in Chapter 35 of the *Building Code*; Chapter 44 of the *Residential Code*; Annex A of the *Electrical Code*; Chapter 8 of the *Fuel Gas Code*; Chapter 15 of the *Mechanical Code*; Chapter 13 of the *Plumbing Code*; Chapter 8 of the *Property Maintenance Code*; Chapter 80 of the *Fire Code*; Section 12 of the *Energy Conservation Code—Commercial Provisions*; Chapter 6 [RE] of the *Energy Conservation Code—Residential Provisions*; Chapter 16 of the *Existing Building Code*; Chapter 12 of the *Green Construction Code*; and Chapter 11 of the *Swimming Pool and Spa Code*, shall be considered a part of the requirements of the *Construction Codes* to the prescribed extent of each such reference.

102.4.1 Conflicts. If conflict arises between the provisions of the *Construction Codes Act*, and the *Construction Codes*, the provisions of the *Construction Codes* shall take precedence. If conflict arises between the *Construction Codes Supplement*, the Model Codes (as defined in Section 101.1), and their referenced standards:

1. The provisions of the *Construction Codes Supplement* shall take precedence over the Model Codes and their referenced standards.
2. The provisions of the Model Codes, other than their referenced standards, shall take precedence over their referenced standards.

102.5 Severability. In the event that any part or provision of the *Construction Codes* is held to be illegal or void, this shall not have the effect of making void or illegal any of the other parts or provisions of the *Construction Codes*.

102.5.1 Severance of invalid provisions. Any illegal or void part of the *Construction Codes* shall be severed from the remainder of the *Construction Codes* by a court holding such part illegal or void, and the remainder of the *Construction Codes* shall remain effective.

102.5.2 Decisions involving existing structures. The invalidity of any provision in any section of the *Construction Codes* as applied to *buildings* and other *structures* constructed prior to the effective date of the *Construction Codes* shall not be held to affect the validity of such section in its application to *buildings* and other *structures* erected after the effective date of the *Construction Codes*.

102.6 Applicable Codes. Except as otherwise expressly provided, and without limiting the generality of Section 102.1, the *Construction Codes*, upon adoption pursuant to Section 122, shall apply to all of the following:

1. All applications filed with the *Department* on or after the date of adoption.
2. All pending applications filed with the *Department* prior to the date of adoption (except to the extent that a pending application has vested under a prior edition of the *Construction Codes* pursuant to Section 123).
3. All permits or certificates issued by the *code official* on or after the date of adoption (except to the extent that

the associated application vested under a prior edition of the *Construction Codes* pursuant to Section 123).

4. All violations or infractions committed on or after the date of adoption.

The legal use and occupancy of any structure existing on the effective date of the *Construction Codes*, or for which a permit has already been approved, shall be permitted to continue without change.

Exceptions:

1. Provisions of the *Building Code*, the *Residential Code*, the *Property Maintenance Code* or the *Fire Code* that are specifically required to be applied retroactively.
2. Provisions of the *Construction Codes* deemed necessary by the *code official*, as defined in Section 103.1, for the general safety, health and welfare of the occupants and the public.

102.7 Violations or infractions. The laws and regulations in force on the date that a new edition of the *Construction Codes* is adopted pursuant to Section 122 shall apply with respect to violations or infractions committed prior to said date, whether the prosecutions or adjudications of those violations or infractions are begun before or after said date.

SECTION 103 DEPARTMENT OF CONSUMER AND REGULATORY AFFAIRS

103.1 Code official. The *Director* shall be, and shall hereinafter be referred to as, the *code official* for the enforcement of the provisions of the *Construction Codes*. Where in the *Construction Codes* the term “building official” is used, it shall mean the “*code official*.”

Exception: Subject to the provisions of Section 103.2 as to *Fire Code* enforcement.

103.1.1 Delegation of authority. The *Director* and the *Fire Chief* shall have the authority to delegate his or her duties and powers under the *Construction Codes*, but he or she shall remain responsible for the proper performance of those duties and powers.

103.1.2 Department. Where used herein the word “*Department*” shall refer to the Department of Consumer and Regulatory Affairs, except that references to “*Department*” in the *Fire Code* shall refer to the DC Fire and Emergency Medical Services *Department* (Fire Department).

103.2 Code official for the Fire Code. The *Fire Chief* shall be the *code official* for the enforcement of the *Fire Code*, except that the *Director* shall be the *code official* for enforcement of all provisions of the *Fire Code* pertaining to approval, installation, design, testing and inspection of (a) new fire protection systems and (b) modifications of existing fire protection systems. The *Fire Chief* shall be the *code official* for maintenance, testing and inspection of all existing fire protection systems.

103.3 Organization. The *Director* or the *Fire Chief* shall appoint such number of officers, technical assistants, inspectors and other employees as shall be necessary for the administration of the *Construction Codes*.

103.3.1 Deputy. The *code official* is authorized to designate an employee or employees as deputy who shall exercise the powers of the *code official* as delegated during the temporary absence or disability of the *code official*.

103.4 Conflicts of interest. No official or employee of the *Department* shall directly or indirectly engage in any private business transaction or activity, which tends in any way to interfere with the performance of his or her duties, including:

1. **Furnishing of services.** Being engaged in, or directly or indirectly connected with, the furnishing of labor, materials or appliances for the construction, alteration or maintenance of a *building* under the jurisdiction of the *Construction Codes*, or the preparation of plans or specifications of a *building* under the jurisdiction of the *Construction Codes*, unless the official or employee is the principal owner of the *building*.
2. **Conflict with official duties.** Engaging in any work which conflicts with official duties or with the interests of the *Department*.
3. **Private work.** Directly or indirectly engaging with or accepting remuneration from any private person, firm, or corporation for the performance of any work as a designer, architect, engineer, consultant or inspector, which work is to be submitted to, passed upon, reviewed or inspected by any officer of the District of Columbia charged with the administration of any portion of the *Construction Codes*.

103.5 Access to public records. Access to the public records of the *Department* is governed by the Freedom of Information Act, effective March 25, 1977 [DC Law 1-96; DC Official Code §§ 2-531 *et seq.* (2016 Repl. & 2018 Supp.)] (the Freedom of Information Act). The public records of the *Department* (as the term “public records” is defined in An Act To prescribe administrative procedures for the District of Columbia government, approved October 21, 1968 [82 Stat. 1203; DC Official Code § 2-502(18) (2016 Repl. & 2018 Supp.)] (the Administrative Procedure Act) shall be available for inspection and copying subject to the exemptions and procedures set forth in the Freedom of Information Act.

103.5.1 Publicly available information. The *Department* shall make the following information available for inspection without a written request:

1. **Permit documents.** Copies of issued permits, permit applications and all documents submitted in support of permit applications (including plans).
2. **Certificates of occupancy.** Copies of issued Certificates of Occupancy.
3. **Other information.** Other information and documents that the *Department* makes publically available on its website.

103.5.2 Fees for related services. Fees for services rendered in response to information requests, including researching and copying any requested documents, are set forth in 1 DCMR § 408.

Exception: Advisory Neighborhood Commissioners shall not be required to pay a fee for researching and copying requested documents intended for official ANC purposes.

SECTION 104 DUTIES AND POWERS OF CODE OFFICIAL

104.1 General. The *code official* is hereby authorized and directed to enforce the provisions of the *Construction Codes*. The *code official* shall have the authority to render interpretations of the *Construction Codes* and to adopt policies and procedures in order to clarify the application of its provisions. Such interpretations, policies and procedures shall be in compliance with the intent and purpose of the *Construction Codes*. Such policies and procedures shall not have the effect of waiving requirements specifically provided for in the *Construction Codes*.

104.1.1 Administrative Bulletins. The *code official* shall have the authority to promulgate from time to time *administrative bulletins* that shall be effective upon publication in the *DC Register*. *Administrative bulletins* shall be titled, numbered, and dated. *Administrative bulletins* shall be publically available at the *Department's* permit center and shall be posted on the *Department's* website.

104.2 Applications and permits. The *code official* shall receive applications, review submittal documents, and issue permits and certificates authorized by the *Construction Codes*, and shall enforce compliance with the provisions of the *Construction Codes*.

104.3 Notices and orders. The *code official* shall have authority to issue all necessary notices or orders to ensure compliance with the *Construction Codes*, and shall have authority to institute administrative and legal actions to correct violations or infractions, including actions pursuant to An Act To provide for the abatement of nuisances in the District of Columbia by the Commissioners of said District, and for other purposes, approved April 14, 1906 [34 Stat. 114; DC Official Code §§ 42-3131.01 *et seq.* (2012 Repl.)] (the Nuisance Abatement Act), and the Due Process Demolition Act of 2002, effective April 19, 2002 [DC Law 14-114; DC Official Code §§ 42-3171.01 *et seq.* (2012 Repl.)].

104.4 Inspections. The *code official* is authorized: (i) to make all inspections necessary to ensure compliance with the *Construction Codes* in accordance with Section 104.6, and (ii) to accept reports of inspection by approved agencies. The *code official* is authorized to engage such expert opinion as is deemed necessary to report upon unusual technical issues that arise.

104.4.1 Post disaster event inspections. The *code official* is authorized to conduct inspections to determine emergency and disaster related damage to *premises* in the District of Columbia in accordance with the *District of Columbia Damage Assessment Emergency Operations*

Plan (September 2015) and any subsequent amendments thereto.

104.5 Identification. The *code official*, and authorized representatives of the *code official*, shall carry proper credentials when inspecting *premises* in the performance of duties under the *Construction Codes*.

104.6 Right of entry. Where it is necessary to make an inspection to enforce the provisions of the *Construction Codes*, the *code official* is authorized to enter the *premises*, or any part thereof, at reasonable times to inspect or to perform the duties imposed by the *Construction Codes* subject to applicable law. This authority includes, but is not limited to, situations where the *code official* has reasonable cause to believe that a condition exists in or upon a *premises* that is contrary to or in violation of the *Construction Codes*. Where attempting to gain entrance for inspection, the *code official* and authorized representatives thereof shall present official credentials.

104.6.1 Occupied residential premises. With respect to the inspection of an occupied residential portion of any *premises* under the exclusive control of a tenant, the *code official* shall not enter that portion of the *premises* without first having obtained permission from the tenant or other *person* of suitable age and discretion who resides there, unless the *code official* has one of the following:

1. A valid administrative search warrant which permits the inspection, pursuant to DC Official Code §§ 11-941 and 42-3509.08 (2012 Repl.), and/or DC Superior Court Civil Rule 204.
2. A reasonable basis to believe that an imminent danger to the public health, safety or welfare exists requiring immediate entry into that portion of the *premises*.

104.6.1.1 Contractors and other persons with common authority over the premises. Where a residential tenant has given access or control to a contractor or other *person* to undertake work on the tenant's portion of the *premises* pursuant to a permit, the *code official* is authorized to obtain consent from the contractor or other *person* with common authority over the *premises* to enter the *premises* for the limited purpose of inspecting the work authorized by such permit.

104.6.2 Interference with inspection. Any *person* who interferes with the *code official* in the performance of authorized duties, or prevents or refuses to allow the *code official* to enter a *premises* or any portion thereof for inspection in the performance of authorized duties, is in violation of the *Construction Codes*.

104.6.3 Refusal of entry. If entry is refused, the *code official* shall have recourse to the remedies provided by law to secure entry, including, but not limited to, application to the Superior Court for an administrative search warrant pursuant to DC Official Code §§ 42-3131.02 and 42-3509.08 (2012 Repl.), and Sup. Ct. Civ. R. 204.

104.7 Retention of public records. The *code official* shall comply with the requirements of the District of Columbia Public Records Management Act of 1985, as amended, effective

tive September 5, 1985 [DC Law 6-19; DC Official Code §§ 2-1701 *et seq.* (2018 Repl.)] (the Public Records Act). Public records of the *Department* [as defined in DC Official Code § 2-1701(13)] shall be maintained for the period of time required by law. Records of permit applications received, permits and certificates issued, fees collected, reports of inspections, and notices and orders issued, and *approved* submittal documents shall be maintained so long as the *building* or other *structure* to which they relate remains in existence, unless otherwise provided for by statute, rule or regulation.

104.7.1. Flood hazard areas. Retention of records for *premises* located in *flood hazard areas* shall comply with Appendix G.

104.8 Liability. The *code official* or *Department* employee charged with the enforcement of the *Construction Codes*, the *Zoning Regulations* or other pertinent laws or regulations, while acting for the District of Columbia in good faith and without malice in the discharge of the duties required by the *Construction Codes*, the *Zoning Regulations* or other pertinent laws or regulations, shall not thereby be civilly or criminally rendered liable personally and are hereby relieved from personal liability for any damage accruing to persons or property as a result of any act or by reason of an act or omission in the discharge of official duties.

104.8.1 Legal defense. Any suit or criminal complaint instituted against an officer or employee of the *Department* because of an act performed by that officer or employee in the lawful discharge of duties and under the provisions of the *Construction Codes*, the *Zoning Regulations* or other pertinent laws or regulations shall be defended by legal representatives of the District of Columbia until the final termination of the proceedings. The *code official* or any subordinate shall not be liable for cost in any action, suit or proceeding that is instituted in pursuance of the provisions of the *Construction Codes*, the *Zoning Regulations* or other pertinent laws or regulations enforced by the *Department*.

104.9 Approved materials, equipment and devices. All materials, equipment and devices *approved* for use by the *code official* shall be constructed and installed in accordance with such approval.

104.9.1 Used materials, equipment and devices. The use of used materials which meet the requirements of the *Construction Codes* for new materials is permitted. Used *equipment* and devices shall not be reused unless *approved* by the *code official*.

104.9.2 Unlabeled products. Where materials, assemblies or products are required by the *Construction Codes* to be labeled, those materials, assemblies or products which are not labeled, listed or classified by an *approved* testing agency and which are proposed to be installed in the District of Columbia, shall be tested and labeled by an *approved* testing laboratory or shall be *approved* in accordance with Sections 1701 and 1703 at the expense of the applicant, before a permit can be granted for this installation.

104.9.3 Assembled components. Any mechanical or electrical appliance which is not labeled, listed or classified by an *approved* testing agency, which is an assembly of individually labeled or listed subassemblies or components and which is proposed to be installed in the District of Columbia, shall be tested and *approved* in accordance with Section 104.9.2 before a permit can be granted for its installation.

104.9.4 Modular structures. Before erecting or installing in the District of Columbia any factory assembled *structure*, manufactured at a remote site and transported in one or more sections, a complete set of drawings shall be submitted for review prior to the issuance of a *building* permit. These drawings shall include a certificate of approval by a factory inspection agency that has been *approved* by the *code official*. The drawings shall be submitted to the *code official* for plan review and permitting and shall include a set of the manufacturer's installation specifications and designate the applicable portions of construction that are required to have field inspection by the *code official*, including all utility connections, the marriage line connections and the foundation plate nailing patterns. These drawings shall be stamped by a structural engineer or architect licensed in the District of Columbia, and include the site constructed or assembled foundation system details and specifications. Separate permits issued by the *Department* for plumbing, mechanical, and electrical connections shall be required. Inspections of all work conducted on-site shall be in accordance with Section 109. Prior to placement of the factory assembled structure on a footing and foundation, all required footing and foundation inspections shall require approval by the *code official*.

104.10 Modifications. Wherever there are practical difficulties involved in carrying out the provisions of the *Construction Codes*, the *code official* shall have the authority to grant modifications for individual cases upon application of the owner or owner's representative; provided that the *code official* shall first find:

1. That special individual reasons make the strict letter of the *Construction Codes* impractical.
2. That the modification is in compliance with the intent and purpose of the *Construction Codes*.
3. That such modification does not lessen health, accessibility, life and fire safety, or structural requirements.

The details of the action granting modification shall be recorded and entered in the appropriate files of the *Department*.

104.10.1 Procedure for modifications. The application for modification shall be submitted on a form provided by the *Department* and sealed by the registered design professional if applicable. The final decision of the *code official* shall be in writing and shall be officially recorded with the application for permit in the permanent records of the *Department*.

104.10.2 Flood hazard areas. Modifications to any provision required in *flood hazard areas* are also subject to Section G105 of Appendix G.

104.10.3 Projections. Modifications to *projection* requirements set forth in Chapter 32 shall also comply with Section 3202.4.

104.11 Alternative materials, equipment, methods of construction and design. The provisions of the *Construction Codes* are not intended to prevent the use of any material, equipment or method of construction not specifically prescribed by the *Construction Codes*, provided any such alternative has been *approved* by the *Department*. Alternative materials, equipment or methods of construction shall be *approved* when the *code official* finds that the proposed design is satisfactory and complies with the intent of the provisions of the *Construction Codes*, and that the material, equipment or method offered is, for the purpose intended, at least the equivalent of that prescribed in the *Construction Codes* in quality, strength, effectiveness, *fire-resistance*, durability and safety. Approvals shall conform to Sections 1701 and 1703. Where the alternative material, design or method of construction is not *approved*, the *code official* shall respond in writing, stating the reasons why the alternative was not *approved*.

104.11.1 Research reports. Supporting data, where necessary to assist in the approval of materials, equipment or methods of construction not specifically provided for in the *Construction Codes* shall consist of valid research reports from sources *approved* by the *code official*.

104.11.2 Tests. Whenever there is insufficient evidence of compliance with the provisions of the *Construction Codes*, or evidence that a material, equipment or method of construction does not conform to the requirements of the *Construction Codes*, or in order to substantiate claims for alternative materials or methods, the *code official* shall have the authority to require tests as evidence of compliance to be made at no expense to the government of the District of Columbia. Test methods shall be specified in the *Construction Codes* or by other recognized and accepted test standards in the industry. In the absence of recognized and accepted test methods, the *code official* is authorized to approve appropriate testing procedures. Tests shall be performed by an agency *approved* by the *code official*. Reports of such tests shall be retained by the *code official* for the period required for retention of public records.

104.12 Reasonable accommodation under the Fair Housing Act. Requests for reasonable accommodation under the Fair Housing Act, 42 USC § 3604(f)(3)(B), as amended, shall be made according to the procedures set forth in 14 DCMR § 111.

104.13 Required procedure. Except where provisions of the *Construction Codes* are modified pursuant to Sections 104.10, 104.11 or 104.12, no deviation from the provisions of the *Construction Codes* is permissible. A verbal waiver or verbal grant of permission by the *code official* or any representative thereof shall not give authority to violate or cancel any provisions of the *Construction Codes*, and shall not be relied upon as a basis for deviation from the provisions of the *Construction Codes*.

SECTION 105 PERMITS

105.1 Required permits. Unless specifically exempted under Section 105.2, an *owner* or authorized agent who intends to undertake any of the activities set forth in Items 1 through 5, or to cause any such work to be done shall first make application to the *code official* and obtain the required permit(s) relevant to the intended work:

1. Construct, enlarge, alter, repair, move, demolish, raze, or change the occupancy of a *building* or other *structure*.
2. Erect, install, enlarge, alter, repair, remove, convert or replace any electrical, gas, mechanical, or plumbing system, the installation of which is regulated by the *Construction Codes*, or to cause any such work to be done.
3. Install tower cranes or other hoisting devices.
4. Movement, addition, deletion, relocation or redesignation of any *lot line*.
5. Undertake any other activity regulated by the *Construction Codes*.

105.1.1 Classification of permits. The *code official* is authorized to classify a permit application based on the applicant's stated scope of work. Permit classifications may include, but are not limited to, the following:

1. *Building* permits.
2. Raze permits.
3. Demolition permits.
4. Trade permits:
 - 4.1. Electrical.
 - 4.2. Gasfitting.
 - 4.3. Mechanical, including refrigeration and HVAC equipment.
 - 4.4. Plumbing.
 - 4.5. Elevators, escalators and other conveying systems.
 - 4.6. Fire alarm system and fire suppression system permits.
 - 4.7. Boilers and pressure vessels.
5. Sign permits (subject to Sections 105.4.5 and 3107).
6. Site development permits (including but not limited to foundation, sheeting and shoring, earthwork, retaining walls and civil sitework (BCIV) permits).
7. Miscellaneous permits.
 - 7.1. Projection permits.
 - 7.2. Crane and derrick permits.
 - 7.3. After-hours permits.
 - 7.4. Fences.
8. Permits for other work as may be determined by the *code official*, and set forth by the *Department* in administrative bulletins.

105.1.2 Compliance with code. The permit shall be an authorization to proceed with the work for which the permit was issued during authorized construction hours and shall not be construed as authority to violate, cancel or set aside any of the provisions of the *Construction Codes*, except as specifically stipulated by modification granted in accordance with Section 104.10.

105.1.3 Authorized hours for work pursuant to a permit. Authorized hours in the District of Columbia, for work conducted under a permit, are from 7 a.m. to 7 p.m. Mondays through Saturdays, excluding legal public holidays. No work conducted under a permit is authorized on Sundays or legal public holidays without an after-hours permit. Legal public holidays are defined in DC Official Code §§ 1-612.02(a) (2016 Repl. & 2018 Supp.).

Exceptions:

1. Interior work exempt from permit requirements, such as interior painting, wallpapering, carpet installation, cleaning or similar activities performed on the interior of a *structure* shall be allowed outside of authorized construction hours, subject to noise regulations in 20 DCMR.
2. Finishing and weather protection activities of concrete where the *code official* determines that such activities are critical to achieving the concrete strength specified by the designer of record shall be allowed outside of authorized construction hours, subject to noise regulations in 20 DCMR.

105.1.3.1 Work outside of authorized hours. No *person* shall engage in any work pursuant to a permit outside of the authorized construction hours specified in Section 105.1.3 including noted exceptions, unless the permit holder has obtained an after-hours permit in compliance with Section 105.4.1.

105.2 Work exempted from permit. This section sets forth exemptions from permit requirements, subject to historic and *flood hazard area* restrictions set forth in Sections 105.2.5 and 105.2.6 respectively. Exemptions from permit requirements of the *Construction Codes* shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of the *Construction Codes* or of any other laws, regulations or ordinances of the District of Columbia.

Building:

1. Brick pointing.
2. Caulking, patching and plaster repair of nonrated assemblies.
3. Installation of window screens and storm windows.
4. Repair *in kind* of existing fences.
5. Application of a paint, sealant, stain or other coating to a surface that, when dried, leaves a

decorative or protective coating over that surface, provided that:

- 5.1. The application of fire-retardant paint shall require the issuance of a permit.
- 5.2. A permit may be required for such application under certain circumstances specified in Section 105.2.5.
6. Papering, tiling, carpeting, floor covering, cabinets, countertops and similar finish work.
7. Replacement *in kind* of one of the items listed hereafter. For the purpose of this section, “replacement in kind” means replacement with a feature of like material that replicates the existing feature in proportion, appearance, texture, design, detail and dimensions.
 - 7.1. *Roof covering* or coping.
 - 7.2. Siding.
 - 7.3. Gutters and downspouts and fascia.
 - 7.4. Private sidewalks and driveways where the area of land disturbance does not exceed 50 square feet (4.65 m2).
 - 7.5. Patios where the area of land disturbance does not exceed 50 square feet (4.65 m2).
 - 7.6. Nonrated suspended ceiling tile.
 - 7.7. Not more than 160 square feet (14.9 m2) of gypsum board excluding installation of fire-rated gypsum wall board or shaft liner.
8. A single garden storage shed that does not exceed 50 square feet (4.65 m2) in area, is less than ten feet (3048 mm) in overall height, is an accessory structure to a *building* of use Group R-3 or to a *building* under the jurisdiction of the *Residential Code*, and is erected on a lot with no other exempted storage shed.
9. Prefabricated pools, spas or water features, accessory to a Group R-3 occupancy, or accessory to *buildings* under the jurisdiction of the *Residential Code*, which are less than 24 inches (610 mm) deep, do not exceed 1000 gallons (3785.41 L), are installed entirely above ground and are not designed or manufactured to be connected to a *circulation system*.
10. Retaining walls that are not over four feet (1219 mm) in height, measured from the bottom of the footing to the top of the wall, only where the area of land disturbance does not exceed 50 square feet (4.65 m2).
11. Shade cloth *structures* constructed for horticultural nursery or agricultural purposes, not including service systems.
12. Swings and other playground equipment accessory to detached one- and two-family *dwelling*s and *townhouses*.

13. A tree house or playhouse, no more than 36 square feet (3.35 m²) in area and accessory to detached one- and two-family *dwelling*s and *townhouse*s.
14. Movable fixtures, cases, racks, counters and partitions not over five feet nine inches (1753 mm) in height.
15. A one-story mausoleum not exceeding 250 square feet (23 m²) in footprint area provided the mausoleum:
 - 15.1. Is of Type I or II construction.
 - 15.2. Does not contain any habitable space.
 - 15.3. Does not require any utility connections.

Notwithstanding the applicability of this permit exemption, the person undertaking the proposed work shall comply with soil erosion and sediment control requirements enforced by *Department of Energy and the Environment* (21 DCMR, Chapter 5).
16. The following signs are exempt from permit requirements:
 - 16.1. Signs with an area no greater than 1 square foot (0.09 m²).
 - 16.2. Interior signs that are not substantially visible from the outside of the *building*.
 - 16.3. Temporary signs (for less than 180 days) that are not more than 10 square feet (0.93 m²) in area and which do not use electricity.
 - 16.4. Noncommercial signs displayed on private property by the owner or occupant of the property, provided, that the sign.
 - 16.4.1. Is not more than 10 square feet (0.93 m²) in area.
 - 16.4.2. Does not use electricity.
 - 16.4.3. Does not require approval by the Commission of Fine Arts, Historic Preservation Review Board or Historic Preservation Office, Office of Planning, or the Chantown Steering Committee.
 - 16.5. Other signs exempted from permitting requirements by any regulations adopted pursuant to the *Sign Legislation*.
17. *Structures* erected for a period of less than 180 days in a 12-month period that cover an area of 150 square feet (13.9 m²) or less and are exempted from permit requirements by Section 3103.
18. Tents and other membrane *structures* erected for a period of less than 180 days that cover an area of 150 square feet (13.9 m²) or less and are exempted from permit requirements by Section 3103.2 of the *Fire Code*.

19. Erection or replacement of fixed or *retractable awnings* projecting 40 inches (1016 mm) or less that are located outside the jurisdiction of the US Commission of Fine Arts or the Historic Preservation Review Board, and are not subject to Section 3202.12, where the *awnings* meet one or more of the following criteria:

- 19.1. *Awnings* installed on detached one- and two-family *dwelling*s and *townhouse*s not more than three stories above grade in height with a separate means of egress.

- 19.2. *Retractable awnings* installed above the first story.

Electrical:

1. Repair portable electrical equipment.
2. Repair lighting fixtures.
3. Repair or replace ballasts, sockets, receptacles, or snap switches.
4. Minor repair work, including the replacement of lamps or the connection of *approved* portable electrical equipment to *approved* permanently installed receptacles, and other minor repairs at existing outlets.
5. Electrical equipment used for radio and television transmissions; however, a permit is required for equipment and wiring for a power supply and the installations of towers and antennas.
6. Listed cord-and-plug connected temporary decorative lighting.
7. Reinstallation of plug receptacles but not the outlets thereof.
8. Replacement of branch circuit overcurrent devices of the required capacity in the same location.
9. Installation of any temporary system required for the testing or servicing of electrical equipment or apparatus.

Gas:

1. Portable heating appliances.
2. Connection of cooking or clothes drying appliances.
3. Replacement of any minor part that does not alter approval of equipment or make such equipment unsafe.
4. Portable-fuel-cell appliances that are not connected to a fixed piping system and are not interconnected to a power grid.

Mechanical:

1. Portable heating appliances.
2. Portable ventilation appliances.
3. Portable cooling units.
4. Steam, hot or chilled water piping within any heating or cooling equipment or appliances regulated by the *Construction Codes*.

5. Replacement of any minor part that does not alter approval of equipment or make such equipment unsafe.
6. Portable evaporative coolers.
7. Self contained refrigerating systems containing 10 pounds (5 kg) or less of refrigerant or that are actuated by motors of 1 horsepower (746 W) or less.
8. Portable-fuel-cell appliances that are not connected to a fixed piping system and are not interconnected to a power grid.

Plumbing:

1. The stopping of leaks in drains, water, soil, waste or vent pipe, provided, however, that if any concealed trap, drainage, water, soil, waste or vent pipe becomes defective and it becomes necessary to remove and replace the same with new material, such work shall be considered as new work and a permit shall be obtained and inspection made as provided in the *Construction Codes*.
2. The clearing of stoppages or the repairing of leaks in pipes, valves or fixtures, and the removal and reinstallation of water closets, provided such repairs do not involve or require the replacement or rearrangement of valves, pipes, or fixtures.
3. Repair or replacement of water meters performed by DC Water.
4. Replacement of kitchen and bathroom sink or faucet, supply lines and exposed P trap connections within detached one- and two-family *dwelling*s and *townhouses*.
5. Replacement of a water closet or water closet seal within detached one- and two-family *dwelling*s and *townhouses*.

105.2.1 [Reserved]

105.2.2 Ordinary repairs. Permits are not required for ordinary repairs to *buildings*, other *structures* or equipment. Ordinary repairs shall not include any of the following:

1. The cutting away of any wall, partition or portion thereof, the removal or cutting of any structural beam or load bearing support, or the removal or change of any required means of egress, or rearrangement of parts of a *structure* affecting the egress requirements.
2. Addition to, alteration of, replacement or relocation of any standpipe, water supply, sewer, drainage, drain leader, gas, soil, waste, vent or similar piping, electric wiring or mechanical or other work affecting public health or general safety.

105.2.3 Public service agencies. A permit shall not be required under the *Construction Codes* for the installation, alteration or repair of equipment and facilities used for generation, transmission, distribution, metering or treatment that is under the ownership or control of public ser-

vice agencies subject to the jurisdiction of the District of Columbia Public Services Commission or DC Water.

Exception: For projects of public service agencies involving land-disturbing activities or major substantial improvement activities as defined in 21 DCMR, Chapter 5, and for all work described in Sections 105.2.5 and 105.2.6, a public service agency shall be required to submit a permit application and, as applicable, thereafter obtain a permit for such project.

105.2.4 Permit exemptions subject to public space requirements. When the proposed scope of work would qualify to be exempted from permit pursuant to Section 105.2 of this chapter, and the work is to occur wholly or partially on *public space*, the applicant shall be responsible for obtaining all public space permit(s) that are required by DDOT.

105.2.5 Permit exemptions not applicable in historic districts or to historically designated structures. When the proposed scope of work would qualify to be exempted from permit pursuant to Section 105.2 and the work is to occur on the land of or the exterior of *buildings* or other *structures* located in historic districts, or of historically designated *buildings* or other *structures*, an application for a *building* permit subject only to historic preservation review pursuant to Section 105.1 shall be required for the following work described in Section 105.2 Building: 1. Brick pointing; 4. Repair or replacement of fences, except as deemed an ordinary repair; 5. Painting of unpainted exterior masonry at a landmark property; 7. Replacement in kind of one of the listed items (except for interior ceiling tile and gypsum board); 8. Garden storage shed; 9. Prefabricated pools; and 10. Retaining walls. The *code official* shall not issue a permit based on an application subject solely to historic preservation review under this section without the prior review and approval of the Historic Preservation Office.

105.2.6 Permit exemptions not applicable in flood hazard areas. When the proposed scope of work would qualify to be exempted from permit requirements pursuant to Section 105.2, and the work is to occur on *premises* wholly or partially within a *Flood Hazard Area*, an application for a permit subject only to review by the *Floodplain Administrator* shall be required. The *code official* shall not issue a permit based on an application subject solely to review by the *Floodplain Administrator* under this section without the prior review and approval of the Floodplain Administrator regarding the disposition of the permit application by the *code official*.

105.3 Application for permit. To obtain a permit, the applicant (as defined in Section 105.3.1) shall submit an application for a permit in the form prescribed and provided by the *code official*. Where a permit is required, it shall be obtained by the applicant prior to the commencement of corresponding work, except as provided in Section 105.4.6.

105.3.1 Authorized applicant. Permit applications shall be submitted by the *owner* or lessee of the *premises*, or an authorized agent of either. (The *persons* referred to in this

section and Section 105.3.1.1 are referred to collectively as the “applicant”).

105.3.1.1 Trade permit applicant. A trade permit application shall be submitted only by, or on behalf of, the DC-licensed master tradesperson who is to be responsible for supervising the work to be done under a trade permit when issued.

105.3.1.2 Change in applicant. Where a change in the applicant is proposed or occurs during the pendency of an unexpired permit application, whether as the result of a transfer of the *premises* or other circumstances, the permit application shall be deemed abandoned pursuant to Section 105.10 unless both of the following occur:

1. The applicant of record notifies the *code official* of a change in applicant.
2. The new applicant submits information required by the *code official* on an *approved form*.

If these actions are not completed by (a) the date that is 30 days after the date on which the change of applicant occurs, or (b) the date on which the permit application is approved, whichever is earlier, the permit application shall be deemed abandoned as of such date.

Exception: Trade permit applications are not transferable.

105.3.2 Form and content of application. Unless otherwise specified by the *code official*, the application shall:

1. Be accompanied by any filing fee deposit required pursuant to Section 108.2.1.1 and any other fees required by the *code official* to be paid at the time of filing. All other fees shall be paid prior to issuance of the permit pursuant to Section 108.
2. Clearly identify and describe the work to be covered by the permit for which application is made.
3. Describe the *premises* on which the proposed work is to be done by address and lot and square.
4. Provide sufficient information clearly distinguishing the existing use of the *premises*, or relevant portion thereof, from the proposed use.
5. Indicate the use and occupancy for which the proposed work is intended.
6. Be accompanied by a fully completed intake form and supporting submittal documents as required by Section 106.

Exception: Submittal documents are not required for permit applications proposing only a change of use or occupant load where no proposed alterations are to be made. If a code compliance issue needs to be addressed following inspection of the *premises*, submittal documents shall be submitted as directed by the *code official*.

7. Include an accurate breakdown of construction valuation in accordance with Section 108.3.
8. Include name and contact information, including a valid e-mail address, for all of the following:
 - 8.1. The applicant.
 - 8.2. The permit expeditor (if applicable).
 - 8.3. The DC licensed general contractor or construction manager (if known when the application is filed; if not known at the time of filing, this information shall be provided to the *code official* by the applicant as soon as the general contractor or construction manager is selected, but no later than the scheduling of the first inspection).
9. Include the name and contact information, including a valid e-mail address, for the *person* designated to receive *Department* communications relating to the application and for electronic service of notices and orders related to the permit based on the application.
10. Include the applicant’s certification that the information provided in the application is true and correct to the best of the applicant’s knowledge, and acknowledging that a false statement in an application may subject the applicant to penalties as listed in Section 105.3.3. Submission of an online application shall be deemed to constitute the certification required under this section.
11. Include the additional information required by Appendix G, Section G104, if the development site is located wholly or partially within a *flood hazard area*, including, but not limited to an *elevation certificate* or *floodproofing certificate* where required.
12. Include the “Standards of External Effects” application required by the District of Columbia *Zoning Regulations* (11-U DCMR, Section 805) if the property is located in a *productions, distribution and repair (PDR) District*.
13. Include a list of names and addresses of *owners* of adjoining *premises* as identified in the Real Property Tax Database maintained by the Office of Tax and Revenue of the Office of the Chief Financial Officer for work subject to notification requirements in Section 105.7 and/or Section 106.2.18.3.
14. Include the name, signature, and license number of the licensed master tradesperson, or licensed elevator contractor or elevator mechanic, responsible for supervising the work as required by Sections 105.4.3 and 105.8, for trade permit applications to authorize work in electrical, mechanical, plumbing, fuel gas systems, or elevators and other conveying systems.

15. Be signed by the applicant (as defined in Section 105.3.1.). Submission of an online application shall satisfy this requirement.

16. Provide such other data and information as required by the *code official*.

105.3.3 Penalties for false statements. False statements in an application shall constitute grounds for permit revocation pursuant to Section 111. Applicants are also subject to criminal penalties pursuant to Section 404 of the District of Columbia Theft and White Collar Crimes Act of 1982, effective December 1, 1982 [DC Law 4-164; DC Official Code § 22-2405 (2012 Repl. & 2018 Supp.)] for false statements.

105.3.4 Responsibility to maintain current e-mail address. While applications are pending for processing and after issuance of a permit, applicants and permit holders are required to inform the *Department* within 5 days of any changes to the e-mailing addresses provided in the underlying permit application as specified in Section 105.3.2, Items 8 and 9. The *Department* will provide any required notices or orders to the e-mail address submitted with the permit application as updated in compliance with this section.

105.3.5 Time limitation of application. An application for a permit for any proposed work shall be deemed to have been abandoned:

1. One hundred eighty days after the date of filing, unless such application has been pursued in good faith, an extension has been granted pursuant to Section 105.3.5.1, or a permit has been issued.
2. Where a change in the applicant occurs and the applicant of record and/or the new applicant fail to comply with the requirements of Section 105.3.1.2.

105.3.5.1 Extension of application time limitation. The *code official* is authorized to grant a maximum of two extensions of time, not exceeding 180 days each, for agency consideration of a permit application, provided that the extension is requested in writing and justifiable cause demonstrated. Refunds of the unused portion of the application file deposit shall be made pursuant to Section 108.6.

105.4 Additional provisions applicable to certain permits.

105.4.1 After-hours permit. No *person* shall engage in any work pursuant to a permit outside of the authorized construction hours specified in Section 105.1.2 including noted exceptions, unless the permit holder has obtained an after-hours permit pursuant to the procedures established by the *code official*. Any work authorized by an after-hours permit shall comply with noise regulations set forth in 20 DCMR and to the conditions set forth in Section 105.4.1.1.

105.4.1.1 After-hours permit impacting residential premises. No permit application for after-hours work in or within 500 feet (152 400 mm) of a *Residence District* or a *Special Purpose District*, or within 500 feet (152 400 mm) of a *premises* with an R occupancy as defined in Chapter 3, shall be approved by the *code*

official without written comments or recommendations of either of the following:

1. Any Advisory Neighborhood Commission(s) (ANC) whose boundaries encompass the *premises* where the after-hours work will take place or are within 500 feet (152 400 mm) of the premises where the after-hours work will take place (collectively the “affected *premises*”).
2. The ANC Commissioner for the single-member ANC District(s) in which the affected *premises* are located (or, where such a seat is vacant, the ANC Chair or the ANC Chair’s designee).

Exceptions: The *code official* is authorized to issue an after-hours permit without the ANC or ANC Commissioner comments or recommendations required by this section:

1. Where the *code official* determines that emergency conditions exist requiring the after-hours work.
2. Where the *code official* determines that the public interest necessitates the after-hours work.

105.4.2 Annual permit. In lieu of an individual permit for each alteration to an existing *approved* electrical, gas, mechanical or plumbing system, the *code official* is authorized, upon application therefor, to issue an annual permit allowing alterations to such installations to any person, firm or corporation regularly employing one or more qualified tradespersons in the *building*, other structure or on the *premises* owned or operated by the applicant for the permit.

105.4.2.1 Annual permit records. The person or entity to whom an annual permit is issued shall keep a detailed record of alterations made under such annual permit. The *code official* shall have access to such records at all times or such records shall be filed with the *code official* as designated.

105.4.3 Trade permits. A trade permit is required for any work involving electrical, gasfitting, mechanical, plumbing, elevators and other conveying systems, and boilers, unless the work is exempted from permit requirements by Section 105.2. Trade permits shall be issued only where the following criteria are met:

1. Where required by Section 105.8., the *person* applying for the trade permit must be a master tradesperson licensed in the District of Columbia who will be responsible for performing or supervising the work to be done under such permit in compliance with the licensing requirements for specific trades as set forth in Section 105.8.
2. Trade permits must be associated with a *building* permit, except in either of the following circumstances:
 - a. Where the *code official* determines that the scope of work is such that review of submittal documents is not required pursuant to Section 106.1.

- b. Where the *code official* determines that, based on the scope of work proposed, the submission of shop drawings is sufficient to ascertain compliance with the *Construction Codes* and the applicant submits shop drawings as required by the *code official* with the trade permit application.

105.4.4 Raze permits. Before a *raze* permit is issued, the owner of the *building* or other *structure* to be razed, or the owner's agent, shall post and maintain a notice furnished by the *code official* on the *premises* where the *building* or other structure is located. The notice shall front on the street of address of the *building* or other structure, or as designated by the *code official*, so as to be readable from the public way. The *raze* permit shall not be issued by the *code official* until the applicant provides an affidavit to the *Department* affirming that the notice has been posted and maintained as required by this section for at least 30 days. This notification requirement shall not apply to any emergency *raze* ordered by the *code official*.

105.4.4.1 Other requirements. Prior to issuing a *raze* permit, the *code official* is authorized to require the applicant to submit other clearances and/or information that the *code official* deems necessary, including, but not limited to, asbestos removal, utility disconnects, grading plans, and historic preservation.

105.4.4.2 Fee. The applicant for a *raze* permit shall pay a fee for the furnishing of the notice required under Section 105.1.3.4 in accordance with the applicable fee schedule published in the *DC Register*, as amended from time to time.

105.4.4.3 Fines. Violations of this section shall be deemed a Class 3 infraction pursuant to 16 DCMR § 3200.

105.4.4.4 Additional notifications required. Applicants for *raze* permits are also required to comply with Section 106.2.18 where the *raze* work involves any structural work within 3 feet (762 mm) of an adjoining *lot line* or excavation work more than 3 feet (762 mm) below existing grade.

105.4.5 Sign permits. To the extent that the *code official* is designated as the permitting and enforcement official for signs, pursuant to the *Sign Legislation* (as defined in Section 202.2), the duties and powers of the *code official* shall be governed by:

1. Chapter 1, 12-A DCMR.
2. Chapter 1, 12-G DCMR, including, but not limited to, the *code official's* authority to receive applications, to review submittal documents and issue permits, to institute administrative and legal actions to correct violations or infractions, and to inspect *premises*.

105.4.5.1 Adoption of superseding sign regulations applicability of *Construction Codes* to signs. Signs shall be designed, constructed installed, displayed and maintained in accordance with the requirements of the *Construction Codes* including, but not limited to, *Building Code* Appendix N, which is hereby expressly adopted and incorporated by reference, and Chapters 7,

15, 16 and 26, except to the extent that such requirements are superseded by regulations adopted by the District of Columbia pursuant to the *Sign Legislation*.

105.4.6 Permits for emergency work. When necessary to make emergency repairs or replacements to *buildings*, other *structures* or systems, an application for a permit to cover all emergency work shall be submitted no later than the first business day following the performance of such emergency work.

105.4.7 Site development permits. The *code official* is authorized to issue a site development permit for earth retention or the construction of foundations before the entire plans and specifications for the whole *building* or other *structure* have been submitted, provided adequate information and detailed statements have been filed complying with all pertinent requirements of the *Construction Codes*. Issuance of a site development permit by the *code official* does not constitute assurance that a permit for the entire *building* or *structure* will be granted. The holder of a site development permit proceeds with the construction at the holder's own risk and without assurance that a permit for the entire *building* or other *structure* will be granted.

105.5 Action on application. The *code official* shall examine or cause to be examined all applications for permit and amendments to applications within a reasonable time after filing. The *code official* may reject an application at the time of filing if the application and required supporting documents are not substantially complete. If the application or the plans do not conform to the requirements of all pertinent laws, the *code official* is authorized to reject such application. The *code official* shall state the reasons for the rejection in writing, citing specific sections of the *Construction Codes*, and stating the applicant's right of appeal under Section 112. If the *code official* is satisfied that the proposed work conforms to the requirements of the *Construction Codes* and all applicable laws, rules, and regulations, the *code official* shall issue a permit as soon as practicable.

105.5.1 Plan review by third-party agency. An applicant shall have the option of using an *approved third-party agency* to perform a code compliance review of a project, at the applicant's expense, pursuant and subject to the provisions of this section; DC Official Code § 6-1405.02 (2018 Repl.); and the *Third-Party Program Procedure Manual*.

105.5.1.1 Notification of intent to use third-party agency for plan review. Where a permit applicant wants to use a *third-party agency* for plan review, the applicant shall notify the *Department* of its intent in accordance with the procedures set forth in the *Third-Party Program Procedure Manual*.

105.5.1.2 Acceptance of certification by third-party agency. The *code official* is authorized to accept a certification, signed and sealed by the professional-in-charge of the *approved third-party agency*, in accordance with the procedures set forth in the *Third-Party Program Procedure Manual*. The *Department* shall complete its review within 15 *business days* after the date of submission of a

complete application package to the *Department*, including the required third-party certification. The *code official's* issuance of related permits will be subject to receipt of any required approvals from other reviewing agencies, and compliance with applicable adjoining *premises* notification requirements.

105.5.2 Stormwater management and erosion and sediment control. A permit shall not be issued for a “major substantial improvement activity” (as defined by 21 DCMR, Chapter 5) or a land-disturbing activity regulated by 21 DCMR, Chapter 5, until the submitted plans reflect the pertinent features *approved* by the official charged with the administration and enforcement of 21 DCMR, Chapter 5, and the requirements of the Water Pollution Control Act of 1984, effective March 16, 1985 [DC Law 5-188; DC Official Code §§ 8-103.01 *et seq.* (2013 Repl. & 2018 Supp.)] as amended.

105.5.3 Flood hazard areas. A permit shall not be issued for work within the scope of Appendix G without review and receipt of comments and recommendations from the *Floodplain Administrator* concerning the *code official's* disposition of the application, as required therein.

105.5.4 Additional grounds for permit denial. The *code official* is authorized to deny issuance of a permit to an applicant because of either of the following:

1. Pursuant to DC Official Code § 6-1407.01.
2. Where the *owner*, applicant, general contractor, construction manager, home improvement contractor, *registered design professional*, *registered design professional in responsible charge*, or responsible officer has outstanding fines, penalties, notices or orders imposed under the *Construction Codes*, or if the *code official* determines that the owner, applicant, general contractor, construction manager, home improvement contractor, *registered design professional*, *registered design professional in responsible charge*, or responsible officer is in violation of any provision of the *Construction Codes*.

105.5.4.1 Code official authority. For purposes of Section 105.5.4 and 105.5.5, the *code official* is authorized to request additional information from an applicant to determine whether the applicant has filed under a new organizational form or name, in order to avoid either permit denial under the provisions of Section 105.5.4 or posting of fine amounts under Section 105.5.5.

105.5.5 Outstanding fines for illegal construction. Where civil infraction citations for illegal construction under Section 113.1 have been issued to an applicant, all applicable fine amounts must be posted with the Treasurer of the District of Columbia by the applicant, prior to the issuance of any permit to the applicant. Upon adjudication of said civil infraction citations, any fines or penalties not assessed to the applicant will be refunded. The *code official*, in his or her discretion, may reduce the amount of the fines required to be posted.

105.5.6 Approval of construction documents. When the *code official* issues a permit, the *construction documents* shall be *approved*, in writing or by stamp, as “Approved.”

Unless submitted electronically, one set of *approved construction documents* so reviewed by the *code official* shall be retained by the *code official* and the other sets shall be returned to the applicant.

105.5.7 Signature on permit. The *code official's* signature shall be attached to every permit, or the *code official* may authorize a subordinate to affix a facsimile of the *code official's* signature to permits. The *code official's* signature shall not be construed as indicating that the construction complies with any other requirement of District law or regulation other than the *Construction Codes* and the *Zoning Regulations*.

105.6 Posting of permit. The permit, or a copy thereof, shall be kept on the work site and conspicuously displayed at a location visible from the street until the completion of work for which the permit is issued. Public information deemed relevant by the *code official* for all permits issued by the *Department* shall be published on the *Department's* website.

105.6.1 On-site retention of construction documents. A legible, printed copy of *approved construction documents* for each permit, of a size sufficient to see all details, shall be kept on-site at all times until a certificate of occupancy for the *premises* subject to the permit is issued or until completion of the work and approval of the final inspection for the work performed at the *premises* under the permit if no certificate of occupancy or new certificate of occupancy is required.

105.7 Notification of owners of adjoining premises in certain districts. Upon issuance of a permit authorizing work on a *premises* in a *Residential*, *Special Purpose* or *Mixed Use District*, and prior to commencing that work, the permit holder shall provide written notice on an *approved* form to each *owner* of a one-family or two-family *dwelling* on a lot adjoining the *premises* on which the work is authorized pursuant to the permit. Delivery of the notification required by this section will be satisfied by mailing the required form to the owner of record of the adjoining *premises* by first-class mail at the address listed in the Real Property Assessment Database maintained by the District of Columbia Office of Tax and Revenue.

105.8 Duties of persons performing work pursuant to a permit. No *person* shall undertake work pursuant to a permit required by Section 105 without possessing a valid and appropriate business license, professional license and/or trade license in the District of Columbia, pursuant to DC Official Code §§ 47-2853.01 *et seq.*, and Titles 16 and 17 DCMR, as applicable.

105.8.1 General contractors, construction managers and home improvement contractors. General contractors, construction managers and home improvement contractors are responsible for hiring and/or subcontracting with *persons* who possess the appropriate license(s) to perform the work, and shall, at all times, be responsible for the proper supervision and inspection of the work and to perform the work in compliance with the *Construction Codes* and the *approved construction documents*. The general contractor, construction manager or home improvement contractor is responsible to employ or subcontract with at

least one master or qualified individual of the appropriate category to perform the duties of a master or qualified individual for trade permits as specified in Section 105.8.2. Upon request by the *code official*, the general contractor, construction manager or home improvement contractor shall provide a written listing of persons holding qualifications specified in Sections 105.8.2.1 through 105.8.2.5, and other employees or subcontractors, with their respective DC license numbers, for each permit in effect.

105.8.2 Performance of work pursuant to trade permit.

The *person* to whom a trade permit is issued shall be responsible for performing or supervising the work to be performed under such permit. Work in electrical systems, refrigeration or air conditioning systems, plumbing systems, fuel gas systems, and elevator and conveying systems that requires a permit shall be performed and supervised in accordance with Sections 105.8.2.1 through 105.8.2.5. Registration and licensure requirements of the applicable tradespersons shall be pursuant to DC Official Code §§ 47-2853.01 *et seq.* (2015 Repl. & 2018 Supp.) and Titles 16 and 17 DCMR. The *code official* is authorized to request current proof of compliance with this section in the course of inspections of such work.

105.8.2.1 Electrical trades. Electrical work requiring a permit shall be performed by a licensed master electrician, a licensed master electrician limited (low voltage), a licensed journeyman electrician, or a registered apprentice electrician under the supervision of a licensed master electrician. A licensed master electrician limited (low voltage) shall be authorized to supervise electrical work in low voltage systems. Licensure and registration requirements for these tradespersons shall be pursuant to D.C Official Code §§ 47-2853.91 through 47-2853.93 (2015 Repl. & 2018 Supp.) and Title 17 DCMR, Chapter 2.

105.8.2.2 Mechanical trades. Refrigeration and air-conditioning work requiring a permit shall be performed by a licensed master mechanic, a licensed master mechanic limited, a licensed journeyman refrigeration and air-conditioning mechanic, or a registered apprentice refrigeration and air-conditioning mechanic under the supervision of a licensed master mechanic. A licensed master mechanic limited shall be authorized to supervise refrigeration and air-conditioning work in systems less than 25 compressor horsepower. Licensure and registration requirements for these tradespersons shall be pursuant to D.C Official Code §§ 47-2853.201 through 47-2853.203 (2015 Repl.) and Title 17 DCMR, Chapters 3 and 15.

105.8.2.3 Plumbing trades. Plumbing work requiring a permit shall be performed by a licensed master plumber/gasfitter, a licensed master gasfitter, a licensed journeyman plumber, a licensed journeyman gasfitter, or a registered apprentice plumber under the supervision of a licensed master plumber/gasfitter. Licensure and registration requirements for these tradespersons shall be pursuant to DC Official Code §§ 47-2853.121 through 47-2853.123 (2015 Repl. & 2018 Supp.).

105.8.2.4 Gasfitting trades. Gasfitting work requiring a permit shall be performed by a licensed master plumber/gasfitter, a licensed master gasfitter, a licensed journeyman plumber, a licensed journeyman gasfitter, a registered apprentice plumber, or a registered apprentice gasfitter under the supervision of a licensed master plumber/gasfitter or of a licensed master gasfitter. Licensure and registration requirements for these tradespersons shall be pursuant to D.C Official Code §§ 47-2853.121 through 47-2853.123 (2015 Repl. & 2018 Supp.).

105.8.2.5 Elevator and conveying systems trades.

Work in elevators and conveying systems requiring a permit shall be performed by a licensed elevator contractor, an employee of a licensed elevator contractor, a licensed elevator mechanic, or a registered apprentice elevator mechanic under the supervision of a licensed elevator contractor or a licensed elevator mechanic. Licensure and registration requirements for these tradespersons shall be pursuant to D.C Official Code §§ 47-2853.95 through 47-2853.99 (2015 Repl. & 2018 Supp.).

105.9 Permit revisions. The holder of a valid active permit shall be authorized to amend it or to amend the plans, application or other records pertaining to the permit by filing, at any time before completion of the work for which the original permit was issued, by submitting an application for permit revision, accompanied by a copy of the originally *approved* submittal documents and, unless submitted electronically, by two sets of the revised plans. If the *code official* approves a permit revision, and a revised permit is issued, it shall be deemed part of the original permit and shall be kept therewith in the official records of the *Department*. A revision permit shall become invalid upon expiration of the original permit it amends. The extension provisions of Section 105.5.1 shall apply to the original permit and shall only affect the respective revision permits to the extent that the original permit is extended.

105.9.1 Code official authority. Nothing herein shall preclude the *code official* from requiring submission of a new permit application, in lieu of permit revisions.

105.10 Expiration of permit. Any permit issued shall become null and void, upon occurrence of any one of the following circumstances, unless a permit extension has been obtained under Section 105.11:

1. The authorized work is not begun within 12 months after the permit is issued, or within 180 days after the permit is issued where the permit is issued for work (a) regulated by the *Residential Code* or (b) to occur on *premises* located wholly or partially within a *Flood Hazard Area*; or
2. The authorized work is suspended or abandoned for a period of 12 months, or for 180 days for permits issued for work (a) regulated by the *Residential Code* or (b) to occur on *premises* located wholly or partially within a *Flood Hazard Area*; or
3. The authorized work has not received inspection approval or partial inspection approval for at least one

inspection required by Section 109 within a period of 12 months, or within a period of 180 days for permits issued for work regulated by the *Residential Code* or to occur on *premises* located wholly or partially within a *Flood Hazard Area*, which period shall commence on the later of (a) the date authorized work is begun or (b) the date of the last approved inspection or partial inspection.

4. The authorized work has not obtained final inspection approval within 48 months after the permit is issued unless the *code official* grants an extension under Section 105.11.

105.10.1. Expiration of permits for unsafe, abandoned or deteriorated premises. Any permit issued for work on *premises* that have been deemed to be unsafe or unfit for human occupancy (in accordance with Section 115 or 116 of this code or Section 108 or 109 of the *Property Maintenance Code*), or abandoned or deteriorated property [in accordance with DC Official Code §§ 42-3171.01 *et seq.* (2012 Repl.)], shall become null and void if the authorized work is not begun within 30 days after the permit is issued and completed within six months after the date work is begun, unless the permit is extended in accordance with Section 105.11. If the work has not been completed within the 180 day period or any extension period granted by the *code official*, the *Department* is authorized to complete the work in accordance with DC Official Code §§ 42-3131.01 *et seq.* (2012 Repl.) and to seek any other remedies or penalties authorized by law, including monetary fines, criminal prosecution, or court orders directing correction or abatement of the violation.

105.10.2 Suspended or abandoned work. In determining whether work has been suspended or abandoned under Section 105.10, the *code official* shall have the right to request documentation from the permit holder and to inspect the *premises* for which the permit has been granted.

105.10.3 Reinstatement of expired permit. The *code official* has the authority to reinstate, in writing, an expired permit upon a showing of applicable extenuating circumstances.

105.11 Extension of permit. A permit may be extended upon written request, prior to expiration and upon a showing of good cause subject to the conditions set forth in this section. The *code official* is authorized to grant no more than four extensions of time, not to exceed 180 days per extension. In no event shall the aggregate extensions of time exceed two years. The *code official* shall have the discretion to inspect the *premises* for which a permit extension has been requested prior to granting an extension.

105.11.1 Permits for single-family dwellings. Notwithstanding the provisions of Sections 105.10 and 105.11, the *code official* is authorized to impose a three year time limit to complete construction of new detached single-family dwellings, additions to detached single-family dwellings and new residential accessory *structures*. The time limit

shall begin from the issuance date of the permit. The *code official* is authorized to grant extensions of time if the applicant can demonstrate substantive progress, characterized by *approved* inspections as specified in this code of at least one inspection within a period of six months or other evidence that would indicate substantial work has been performed.

105.12 Change in permit holder. Where a change in the permit holder of a valid, unexpired permit is proposed or occurs, whether as the result of a transfer of the *premises* or other circumstances, the permit shall be deemed null and void unless, within 30 days after the date on which the change of permit holder occurs:

1. The permit holder of record notifies the *code official* of a change in permit holder.
2. The new permit holder submits information required by the *code official* on an *approved* form.

Exception: Trade permits are not transferable.

105.13 Surrender and cancellation of permits. If a permit holder desires to terminate a valid permit, the permit holder shall surrender the permit to the *Department* with a notarized affidavit stating the permit holder's irrevocable renouncement of all rights under the permit. Upon receipt of the surrendered permit and affidavit terminating the permit holder's rights under the permit, the *Department* shall declare the surrendered permit invalid and cancel the permit. The *code official* is authorized to conduct an inspection of the *premises* under Section 104.4 in connection with the surrender or cancellation.

105.14 Revocation of permits. Procedures for revocation of permits are set forth in Section 111. Appeals of permit revocations shall be governed by Section 112.

SECTION 106 SUBMITTAL DOCUMENTS

106.1 General. Submittal documents shall consist of *construction documents* (as specified in Section 106 or as may be required by the *code official*), a statement of *special inspections*, reports, and other data. The *construction documents* shall be prepared by a *registered design professional* where required by the *Construction Codes*. Where special conditions exist, the *code official* is authorized to require additional *construction documents*, including those submittal documents to be prepared by a *registered design professional*.

Exception: Where the *code official* deems that the nature of the work applied for is such that review of submittal documents is not necessary to confirm compliance with the *Construction Codes*, the *code official* is authorized to accept and process a permit application without some or all of the otherwise required submittal documents, or to modify the form and content of any otherwise required submittal document, provided, that this exception does not apply where the *Construction Codes* require submittal documents to be prepared by a *registered design professional*.

106.1.1 Electronic submission. Required submittal documents shall be submitted electronically with each permit application.

Exception: Applicants are authorized to submit four sets of *construction documents* and one set of all other submittal documents, in lieu of an electronic submission where specified by the *code official*.

Where submittal documents are not required to be submitted electronically, the *code official* is authorized to establish requirements, including but not limited to maximum overall size, for submittal documents acceptable for review.

106.1.2 Scale of construction documents. All *construction documents* shall be drawn to the scale of not less than $\frac{1}{8}$ inch to the foot (10 mm/m).

Exceptions:

1. Site plan.
2. Building plat.

106.2 Construction documents. *Construction documents* shall be in accordance with Sections 106.2.1 through 106.2.20.

106.2.1 Architectural and engineering details. The *code official* shall require adequate details of architectural, structural, accessibility, fire protection, electrical, fuel gas, mechanical, plumbing, energy conservation, and green *building* provisions to be submitted, including computations, stress diagrams, sound transmission details and other technical data essential to assess compliance with the *Construction Codes*, as further specified in Section 106. In addition, these *construction documents* shall include the following:

1. Concrete and masonry strengths, floor and wall design and reinforcement details.
2. Wood framing design and details.
3. Footing, foundation wall design and details.
4. Roof framing design and details.
5. Interior supporting elements and details.
6. Premanufactured systems referenced in Section 106.2.1.14.
7. Underpinning, sheeting and shoring and associated schedules.
8. Fire-rated walls, floors, roofs and other assemblies with details of installation.
9. For exterior alteration of and/or addition to an *existing structure*, include photograph(s) that clearly depict the condition of the *structure's* front, rear, sides, roof, and adjoining roofs, as applicable, at the time the permit application is submitted.

106.2.2 Means of egress. The *construction documents* shall show in sufficient detail the location, construction, size and character of all portions of the means of egress, including the path of the *exit discharge* to the *public way*, in compliance with the provisions of the *Construction*

Codes. In occupancies other than Group R-2, R-3 and I-1 occupancies, the *construction documents* shall designate the number of occupants to be accommodated on every floor and in all rooms and occupiable spaces.

106.2.3 Exterior Envelope. The *construction documents* for all *buildings* shall describe the exterior wall envelope, roof envelope and *building* thermal envelope in sufficient detail to determine compliance with the *Construction Codes*. The *construction documents* shall provide details of the exterior wall and roof envelope as required, including materials, flashing, intersections with dissimilar materials, corners, end details, control joints, intersections at roof, eaves or parapets, means of drainage, water-resistive membrane, details around openings, fire-resistive construction and fire-resistive protection of wall openings, wall cavities and intersections with floor assemblies, as applicable.

106.2.3.1 Exterior opening near a lot line. Where exterior wall openings are provided in accordance with Section 705.8.7, the *construction documents* shall include separate drawings illustrating compliance with all criteria of Section 705.8.7 in its entirety. Drawings shall indicate distances to interior record lot lines, adjacent *buildings*, percentages of exterior openings, protection of openings, and vertical distances above adjacent *buildings* on the same or adjacent lots as needed to demonstrate compliance with Section 705.8.7.

106.2.4 Structural documents. Before a permit is issued and before work can begin, structural documents shall be submitted in accordance with Section 1603, showing the complete design, with sizes, sections, and relative locations of various structural members, floor elevations, column, or bearing wall centers, and beam or joint sizes and spacings. A geotechnical report shall be provided where required by Sections 1705.6 and 1803. The *code official* shall have the right to require that the structural computations for the *structure* be submitted for review.

106.2.5 Fire protection documents. The applicant shall provide plans and schedules of sufficient detail showing the applicable features and characteristics of all fire protection systems components for any system required by the *Construction Codes* or otherwise proposed to be installed. The *construction documents* shall show the location and type of all fire alarm devices, fire alarm control equipment and panels, fire alarm primary and backup power sources. The *construction documents* shall include sufficient information and detail to adequately describe the elements of any smoke control systems including stair pressurization calculations, equipment location and engineering needs as required by the *Construction Codes*. The *construction documents* shall show the standpipes and automatic sprinkler system infrastructure including the location, size and type of risers, valves, flow and pressure sensors, Siamese connections, fire pump, jockey pump, pump controllers, pump test pipes and other appurtenances of the system, as applicable. The type of sprinkler system and areas and openings requiring special coverage shall be

so noted on the *construction documents*. The *construction documents* shall show details of other fire suppression systems, including gaseous and kitchen hood systems. The *construction documents* shall show capacities and loads of the means of egress, maximum travel distances at every floor, remoteness between exits, fire-resistance rating of structural members, floors and walls enclosing means of egress, rating of fire doors and fire dampers, fire stop penetration details at rated wall and floor assemblies, location and type of exit signs and emergency lighting. *Construction documents* for work in part of an *existing building* shall include a scoping document listing all floors of the *building* and the extent to which each floor is protected with an automatic fire suppression system.

106.2.6 Elevator and other conveying systems documents. The applicant shall provide plans and schedules of sufficient detail showing the applicable features and characteristics of all conveying systems components for any system required by the *Construction Codes* or otherwise proposed to be installed. The *construction documents* shall clearly show:

1. The location, overall dimensions and type of all vertical transportation systems.
2. The primary and secondary levels of elevator recall, the location and type of elevator lobby smoke detectors, other smoke detectors for elevator recall, as well as other fire alarm and fire suppression devices proposed to be installed in elevator machine rooms, elevator pits and top of elevator hoistways and shall include a sequence of elevator operation in emergency mode when such fire detection equipment is activated.
3. The primary and backup power sources for the elevator equipment.
4. Clearances at top and bottom of hoistway and at elevator equipment spaces, minimum interior dimensions of cabs, provisions for access to elevator pits, provisions for drainage of elevator pits, provisions for illumination and electric power in elevator machine rooms, elevator hoistways, elevator pits and elevator equipment spaces shall be shown on the *construction documents*, as applicable.
5. The location of provisions for emergency disconnect of elevator power in elevator pits, elevator machine rooms and elevator equipment spaces, and shall show the location of sprinkler valves and sprinkler flow sensors for systems serving elevator machine rooms and hoistways, as required.

106.2.7 Electrical documents. The applicant shall provide plans and schedules of sufficient detail and clarity showing the location and capacity of all lighting facilities, electrically operated equipment and electrical circuits required for all service equipment of the *building* or other *structure*. All electrically controlled devices, including signal, communicating and lighting systems and associated wiring, wherever required under the provisions of the

Construction Codes, shall be shown on the electrical plans for the following purposes:

1. Control of emergency lighting systems in places of public assembly and education and, in accordance with Section 1008, and life safety systems for hazardous uses in Sections 414 and 415.
2. Stairway and exit illumination in accordance with Sections 1006 and 1205, "Exit" sign lighting circuits in accordance with Section 1011, and elevator car illumination in accordance with Chapter 30.
3. Electrical equipment and control of heating, refrigerating and ventilating machinery and devices in accordance with the *Mechanical Code*.
4. Fire protective signaling systems, automatic fire detection systems, fire department communications and supervisory services in accordance with Sections 901.6 through 901.6.3 and Section 907.
5. Wiring of signs in accordance with Section 3107, and telecommunication and broadcast towers in accordance with Section 3108.
6. Power control electric operation and circuit wiring of elevators, escalators and other conveying systems in accordance with Chapter 30.
7. Illumination of spaces intended for human occupancy in accordance with Section 1205.
8. Backup emergency and standby power systems.
9. Lighting intensity levels along all required paths of egress.
10. All fire stop penetration details at rated wall and floor assemblies.
11. Fault current calculations.
12. Service size and load calculations.
13. Riser diagram with details.
14. Panel schedule with details and references.

106.2.7.1 Exemptions. Electrical plans shall not be required for the following:

1. Any work exempted from the building permit requirement in accordance with Section 105.2.
2. Repair or replacement in kind of electrical equipment.
3. Work involving only *structures* without equipment regulated by the *Electrical Code*, such as open sheds for storage purposes, detached private garages and other similar spaces not required by the *Construction Codes* to be provided with electric current.
4. Temporary sanitary installations required for construction operations.

106.2.8 Fuel gas documents. The applicant shall provide *construction documents*, engineering calculations, diagrams and other data, which shall be of sufficient clarity to

indicate the location, nature and extent of the fuel gas work proposed and show in detail that the work conforms to the provisions of the *Construction Codes*. *Construction documents* shall indicate where penetrations will be made for installations and shall indicate fire stop penetration details at rated wall and floor assemblies. Plans must include a piping plan with gas riser diagram.

106.2.9 Mechanical documents. The applicant shall provide diagrammatic mechanical equipment or system and mechanical plans, which shall show the location and arrangement of the mechanical equipment, fuel systems, ductwork and appurtenances, including safety and pressure-controlling devices. The plans shall show in sufficient detail the relevant features and clearances of the appliances and systems, including: fire stop penetration details at rated wall and floor assemblies, and size and type of apparatus; construction of flue, stack or chimney; stack connections; type of fuel; method of operation; and the method of compliance with all the applicable regulations for the class and type of equipment installed.

106.2.9.1 Exemptions. Mechanical plans shall not be required for the following:

1. Any work exempted from *building* permit requirement in accordance with Section 105.2.
2. Repair or replacement in kind of mechanical equipment.
3. Work involving only *structures* without equipment regulated by the *Mechanical Code*, such as open sheds for storage purposes, detached private garages and other similar spaces not required by the *Construction Codes* to be heated.

106.2.10 Plumbing documents. The applicant shall provide plans of each floor and of a typical floor showing the complete plumbing system layout, all plumbing fixtures, total drainage fixture unit (DFU) values, the water supply piping layout, together with *building* sections showing vertical and diagrammatic elevations of the soil, waste, vent and water supply lines with traps and valves, and the location and size of the public sewer or other disposal system. The plumbing plans shall show in sufficient detail: the layout and spacing of fixtures; the size, material and location of the *building* and storm sewers and drains; the soil, waste, vent and water supply piping; the method or equipment proposed to prevent cross-contamination and backflow; and fire-stop penetration details at rated wall and floor assemblies.

106.2.10.1 Public sewer. Plans for new plumbing or alterations to existing plumbing systems shall be accompanied by a diagram showing the relative elevation of the lowest fixture and the top of the public sewer referred to in the established datum of DC Water. The plans shall show the size, number and location of all new sewer connections. When relevant to the scope of work, the permit applicant shall secure from DC Water the location and other necessary details regarding water and sewer mains to serve the *premises* to be permitted and shall submit this information with the permit application to the *code official*.

106.2.10.2 Public water main. Where the installation of a water distribution system or the replacement or alteration of an existing water supply system is contemplated, the plumbing plans shall show the location and size of all water lines and branches involved, all fixtures or other devices to be supplied and the minimum water pressure in the main in front of the *building* or other structure.

106.2.10.3 DC water Certificate of Approval. A water and sewer Certificate of Approval, issued by DC Water, shall be provided with the plumbing plans for every project where DC Water is requested to furnish new water or sewer service connections.

106.2.10.4 Exemptions. Plumbing plans shall not be required for the following:

1. Any work exempted from building permit requirement in accordance with Section 105.2.
2. Repair or replacement in kind of plumbing fixtures.
3. Work involving only *structures* without plumbing fixtures, such as open sheds for storage purposes, detached private garages and temporary installations for exhibition purposes where not designed for sanitary use and not directly connected to a sewage system.
4. Temporary sanitary installations required for construction operations that are not designed to be directly connected to the public sewer system.

106.2.11 Energy conservation documents. The applicant shall provide plans and schedules of sufficient clarity to indicate the location, nature and extent of the work proposed and show in sufficient detail pertinent data and features of the *building* and the equipment and systems as herein governed, including, but not limited to:

1. Design criteria, exterior envelope component materials, insulation materials and their *R*-values.
2. Fenestration *U*-factors and SHGCs.
3. Area-weighted *U*-factor and SHGC calculations, and mechanical system design criteria.
4. Mechanical and service water heating systems and equipment types, sizes and efficiencies.
5. Economizer description, equipment and system controls.
6. Fan motor horsepower (hp) and controls.
7. Duct sealing, duct and pipe insulation and location.
8. Lighting fixture schedule with wattage and control narrative.
9. Air sealing details.
10. Other pertinent data to indicate compliance with the requirements of the *Energy Conservation Code* and relevant laws, ordinances, rules and regulations, as determined by the *code official*.

106.2.12 Green Building documents. The applicant shall provide plans and supporting documents in sufficient detail and clarity to show compliance with the relevant green building construction practices as required by the *Green Construction Code* or an alternative compliance path selected pursuant to Section 101.12, and with any green building submittal requirements specified by the *code official* as set forth in the *Department's Administrative Bulletins*.

106.2.13 Zoning compliance review data. The applicant shall provide to the Zoning Division of the *Department* plans showing orientation of the lot as to North, drawn to a scale indicated numerically as well as depicted graphically, and including the following information:

1. The shape, dimensions and topography of the lot to be built upon, in sufficient detail to allow determination of heights above both the existing grade and the proposed finished grade of all proposed *structures*, so as to allow determination of compliance with pertinent height limitations of the *Zoning Regulations*.
2. The width of all public streets and public rights-of-way contiguous to the lot, with elevations at measuring points along them sufficient to determine compliance with the An Act To regulate the height of buildings in the District of Columbia, approved June 1, 1910 [36 Stat. 452; DC Official Code § 6-601.05 (2018 Repl.)] as amended.
3. The shape and location in plan of all existing and proposed *structures*, fully dimensioned and labeled, including orientation, elevation in relationship to existing and proposed grades, and distances to lot lines so as to define without ambiguity the dimensions and location of said *structures*.
4. Longitudinal elevations of all existing and proposed *structures* fully dimensioned and shown in relation to the entire lot and the existing and proposed grades, so as to define without ambiguity the dimensions of said *structures*.
5. The parking and loading plans, with labels distinguishing existing facilities from proposed facilities, and the basis for computation of the facilities shown on those plans.
6. The location and elevation of any proposed retaining walls higher than 48 inches (1219 mm) above existing grade.
7. A Zoning Data Summary of the project including, as applicable to the particular requirements of the zone in which the *premises* that are subject to the permit application, at least the following data: lot width; area of the lot; percentage of lot occupancy; height of the *structure* and the location and elevation of the height measurement reference points; gross floor area for each floor level; area of basement; area of cellar; proposed floor area ratio; areas dedicated to each use; width of any proposed side yard, rear yard or court; number of standard and compact parking

spaces; and dimensions of loading berths and delivery loading spaces.

8. Other information necessary to determine compliance with the *Zoning Regulations*.

106.2.14 Shop drawings. Before construction or installation of the elements and systems listed below, the *code official* is authorized to require submission of shop drawings bearing the review stamp of the engineer of record, and bearing the seal and signature of the *registered design professional* who designed the system. Where the project is subject to the mandatory electronic submission requirements in Section 106.1, shop drawings shall be submitted electronically unless otherwise allowed by the *code official*. Where electronic submission is not required, four sets of shop drawings shall be submitted.

1. Structural steel and steel trusses, with connection details.
2. Open web steel joists.
3. Precast and prestressed concrete.
4. Post tensioning.
5. Space frames.
6. Strong backs.
7. Curtain wall.
8. Structural wood trusses, beams, girders, and posts with connection details
9. Concrete mixes.
10. Structural, electrical, and mechanical loads related to new construction installations of elevators, escalators and other conveying systems including, but not limited to, accessibility lifts.
11. Pre-engineered elements.
12. Suspended plaster ceiling systems.
13. Underpinning.
14. Sheeting and shoring.
15. Formwork.
16. Automatic fire suppression systems.
17. Fire alarm systems.
18. Smoke control systems.
19. Commercial kitchen hood suppression systems.

Exception for Items 16, 17 and 19: The *code official* is authorized to accept the following shop drawings without the seal and signature of the *registered design professional* who designed the system:

1. Where the automatic fire suppression systems shop drawing bears the stamp and signature of a National Institute for Certification in Engineering Technology (NICET) Level III Technician certified in Automatic Sprinkler System Layout or Special Hazards Suppression Systems.

2. Where the fire alarm shop drawing bears the stamp and signature of a NICET Level III Technician certified in Fire Alarm Systems.
20. Flammable and combustible liquid storage tanks.
21. All installations, modernizations or alterations of elevators and conveying systems.

106.2.15 Official building plat. The applicant shall provide an official building plat of a lot that is the subject of an application, issued by the DC Office of the Surveyor, in duplicate or by electronic submission, as part of applications for permit involving any of the following:

1. Erection of a new *building* or other *structure*.
2. Addition to an *existing building*.
3. Permanent construction higher than 48 inches (1219 mm) above grade, outside the footprint of *existing buildings*.
4. Construction or alteration of projections into public space.
5. Erection of retaining walls higher than 48 inches (1219 mm).
6. Establishment of new parking spaces or loading berth(s) external to a *building* or other *structure*, regardless of the amount of work involved.

106.2.15.1 Plat information. The applicant shall show upon the *building* plat, completely dimensioned and drawn in ink to the same scale as the plat, the following:

1. The outline of all *buildings*, additions, or other *structures* existing and to be constructed, with existing structures labeled and clearly distinguished from those to be constructed.
2. The number, size, shape and location of all open parking spaces, open loading berths, and approaches to all parking and loading facilities, as applicable, external to a *building* or other *structure*, as well as all approaches to all parking and loading facilities existing and to be installed on the lot, whether within or exterior to any *building* or other *structure*, with existing parking and loading facilities labeled and clearly distinguished from those proposed to be added.
3. The grade in elevation datum on the edges of the lot and any change in grade over 5 feet (1524 mm) within the lot, or a statement by the owner or agent that no change in grade over 5 feet (1524 mm) occurs on the lot.
4. Any proposed pervious surface to be used to satisfy zoning requirements.
5. Other information deemed necessary by the Zoning Administrator to determine compliance with the *Zoning Regulations*. If necessary due to the complexity of the proposed work, the Zoning Administrator is authorized to require the submission of two plats, one depicting existing conditions, including *structures* and topography, and

the other depicting proposed conditions, including *structures* and topography.

106.2.15.2 Certification of plat. The accuracy of the representation of the location of the *structures* on the plat shall be self-certified by the *owner* or authorized agent for the *owner* of the lot of record or parcel of land, who shall sign a certificate in a form prescribed by the *code official*, printed on the building plat.

106.2.16 Site plan. The applicant shall provide a site plan, which shall not substitute for the official building plat required by Section 106.2.15, whenever the application for permit involves any of the following:

1. Erection of a new *building* or other *structure*.
2. Addition to an *existing building*.
3. Permanent construction outside the footprint of *existing buildings*.
4. Construction or alteration of projections into public space.
5. Erection of retaining walls.
6. A major substantial improvement activity (as defined by 21 DCMR, Chapter 5) or a land-disturbing activity regulated by 21 DCMR, Chapter 5.
7. *Demolition* or razing of existing *structures* or *buildings*.
8. Installation or replacement of underground utility service connections.
9. Installation or replacement of site drainage systems.
10. Alteration to the path of the *exit discharge* to the *public way*.
11. Construction in whole or in part on a *development site* in whole or in part within a *flood hazard area* as established in 20 DCMR, Chapter 31.

106.2.16.1 Site plan information. The applicant shall show upon the site plan, completely dimensioned and drawn to a scale indicated numerically and graphically, the following:

1. The site.
2. Its orientation to North.
3. The location and dimensions of all existing structures on the site, labeled if it is to be demolished or to be retained.
4. The location and dimensions of all new construction on the site.
5. The distances from *lot lines*.
6. The established street grades.
7. The existing and proposed finished grades, including any change over 5 feet (1524 mm) across the lot.
8. Any features required to comply with 21 DCMR, Chapter 5.

9. Location of the path of the *exit discharge* to the *public way*.
10. Location of utility service lines and connections thereto (with dimensions and all appurtenant features of such connections).
11. Where a *development site* is wholly or partially within a *flood hazard area*, then the *flood hazard area(s)* floodways and identification of *design flood* elevations, as applicable, shall be provided in compliance with Appendix G.

106.2.17 Flood Hazard Areas—Additional Submission Requirements. For *development* in a *development site* that is within the scope of Appendix G, the applicant shall provide the additional information and data required by Appendix G as part of the permit application.

106.2.18 Protection of Adjoining Premises—Additional Submission Requirements.

106.2.18.1 Underpinning. Where underpinning is chosen to provide the protection or support of adjoining *premises*, the applicant shall provide such information as the *code official* deems necessary to determine the applicant's compliance with the applicable provisions of the *Construction Codes*.

106.2.18.2 Excavations. Where an application for permit proposes excavation work, the *code official* is authorized to require the applicant to submit additional data the *code official* deems necessary to determine the appropriateness of the proposed structural measures to protect the integrity of the soil and *structures* located on the adjoining *premises*.

106.2.18.3 Notification of owners of adjoining premises. Notification of *owners* of adjoining *premises* (and *owners* of adjacent *premises* for snow drift loads) shall be provided by the applicant pursuant to the procedures set forth in Section 106.2.18.3.1, where the proposed work involves all or any of the following:

1. Where excavation requiring a permit will occur on the construction site.
Exception: Where the *code official* determines that the excavation work will not have any adverse impact on structural or lateral support of the adjoining *premises*.
2. Where there is a need to install permanent or temporary structural support for an adjoining *premises* or portion thereof, including but not limited to underpinning, as a result of the proposed work.
3. Where the proposed work will alter imposed loads on a party wall or any load-bearing member of an adjoining *premises*.
4. Where access to an adjoining *premises* is required to install protective measures or undertake other work required by Section 3307.
5. Where the proposed work will render or potentially render adjoining or adjacent *premises* non-compliant with the Chimney Provisions (as

defined in Section 3307.1.1) or with the snow load requirements in Section 1603.1.3 or Section R301.2.3 of the *Residential Code*, as applicable.

Exception: Notification is not required for applications submitted pursuant to Section 3307.1.4, by the owner of an adjoining or adjacent *premises* that has assumed responsibility for any required protective work.

For purposes of this section, a “party wall” shall be defined as “a wall that straddles, or is in close proximity to, a *lot line*, and which is used for structural support by two or more adjoining *buildings* or *structures*.”

106.2.18.3.1 Evidence of notification. As required by this section, and prior to permit issuance, the *applicant* shall provide evidence of notification, consisting of:

1. Evidence of the posting required by Section 106.2.18.3.1.1.
2. Evidence of the delivery of written notice required by Section 106.2.18.3.1.2.
3. The affidavit of maintenance required by Section 106.2.18.3.1.3.

No permit application within the scope of Section 106.2.18.3 will be granted without the specified evidence of notification, except as provided in Section 106.2.18.3.1.3.

106.2.18.3.1.1 Required posting. A notice of the filing of a permit application within the scope of Section 106.2.18.3 shall be posted by the applicant on the *premises* upon which the permit application seeks authorization to perform the work, and shall comply with the following conditions:

1. The notice shall be posted for a continuous period of at least 30 days, including the 30-day period immediately prior to issuance of the permit.
2. The notice shall be given on a form approved by the *code official* and shall be legible from the *public way* that provides the main entrance to the *premises*, as determined by the *code official*.
3. If the notice is destroyed, damaged, or removed during the posting period, the *applicant* shall promptly replace the notice.
4. Photographic evidence of the required posting shall be submitted to the *code official* by the *applicant*, and the associated permit(s) shall not be issued without this photographic evidence.

106.2.18.3.1.2 Required written notice. Prior to submission of a permit application within the scope of Section 106.2.18.3, the *applicant* shall provide written notice in an approved form to the

owner or owners of the adjoining premises in accordance with one of the methods below:

1. By US postal service registered or certified mail to the address of the owner as maintained in the Real Property Tax Database maintained by the Office of Tax and Revenue of the Office of the Chief Financial Officer.
2. By proper use of an approved private delivery service (such as Federal Express, UPS, or DHL) to the address of the owner as maintained in the Real Property Tax Database maintained by the Office of Tax and Revenue of the Office of the Chief Financial Officer.

106.2.18.3.1.2.1 Evidence of delivery of written notice. Acceptable evidence of delivery of written notice shall consist of: (1) proof of proper use of registered or certified mail (registered or certified mail sender's receipt); or (2) proof of proper use of an approved private delivery service.

106.2.18.3.1.3 Affidavit of maintenance. Prior to permit issuance, the applicant shall submit a notarized affidavit attesting that the posting required by Section 106.2.18.3.1.1 was continuously maintained for the requisite 30-day period of time.

106.2.18.3.1.4 Substantial compliance with notification requirements. The code official is authorized to grant a permit application, that is otherwise complete, where the code official determines, based on a written request submitted to the code official by the applicant, the applicant has substantially complied with the provisions of Section 106.2.18.3.1. The determination by the code official of substantial compliance is not subject to reconsideration or appeal under Section 112 absent compelling evidence submitted by the owner of the adjoining or adjacent premises that such owner was directly and adversely affected by a lack of notice.

106.2.18.4 Access to adjoining premises. Where an application proposes work that will or potentially require Protective Work (as defined in Section 3307) on an adjoining or adjacent premises, and such Protective Work will require access to the adjoining or adjacent premises by the applicant, a permit shall not be issued until the applicant submits one of the following:

1. A written agreement in an approved form signed by the applicant and the owner of the adjoining or adjacent premises that grants access to the applicant to undertake the Protective Work.
2. A written agreement signed by the applicant and the owner of the adjoining or adjacent premises that denies access to the applicant and which acknowledges the obligation of the owner of the

adjoining or adjacent premises to be responsible for the Protective Work on such owner's premises.

3. A court order granting the applicant access to the adjoining or adjacent premises to perform the Protective Work.
4. A revised work plan that eliminates the need for access to the adjoining or adjacent premises.

Exception: A limited or temporary right of access to the adjoining premises is expressly granted in Sections 3307.2.2 or 3307.4.1 for the specific Protective Work required.

106.2.19 Covenants and agreements. Where a covenant or agreement is required by the Construction Codes or drafted in connection therewith (a required covenant), a copy of the required covenant, certified by the Recorder of Deeds as having been recorded in the Land Records, shall be submitted by the owner or authorized agent to the code official as and when required by Section 120. The required covenant shall comply with DC Official Code § 6-1405.01(b) (2018 Repl.) and with the provisions of Section 120, as applicable.

106.2.19.1 Other agency covenants. Where an agency other than the Department requires a covenant or agreement relating to proposed construction, including, but not limited to, the covenants specified in Section 120.4, the applicant shall comply with such other agency's requirements.

106.2.20 Construction noise—additional submission requirements. No permit for construction, demolition or raze shall be issued until the permit applicant has provided as part of the permit application written acknowledgment that the noise emanating from the planned activity will comply with the limitations established by the noise regulations set forth in Title 20 DCMR.

106.3 Statement of special inspections. A statement of special inspections shall accompany each application where special inspections and tests are required by Sections 109.3.13 and 1705. Submission of a statement of special inspections complying with Section 1704.3 shall be a condition for permit issuance as specified in Section 1704.2.3.

106.4 Registered design professional. The design of work for new construction, repair, expansion, addition or alteration projects submitted for permit shall comply with Sections 106.4.1 through 106.4.6, as applicable.

106.4.1 Architectural services. Where the project involves the practice of architecture, as defined by D.C. Official Code § 47-2853.61 (2015 Repl. & 2018 Supp.), the corresponding permit documents shall be prepared by an architect licensed to practice architecture in the District of Columbia. All plans, computations, and specifications required to be submitted in connection with a permit application for such architectural work shall be prepared by or under the direct supervision of an architect with a valid and unexpired District of Columbia architecture license and shall bear the architect's signature and seal in accordance with the laws of the District of Columbia.

106.4.2 Engineering services. Where the project involves the practice of engineering, as defined by D.C Official Code § 47-2853.131 (2015 Repl. & 2018 Supp.), the corresponding permit documents shall be prepared by a professional engineer licensed to practice engineering in the District of Columbia. All plans, computations, and specifications required to be submitted in connection with a permit application for such engineering work shall be prepared by or under the direct supervision of a professional engineer with a valid and unexpired District of Columbia engineer license and shall bear the engineer's signature and seal in accordance with the laws of the District of Columbia.

Exception: An architect licensed in the District of Columbia is authorized to perform engineering work that is incidental to the practice of architecture, as permitted by D.C Official Code § 47-2853.61 (2015 Repl. & 2018 Supp.).

106.4.3 Interior design services. Plans for nonstructural alterations and repairs of a *building*, including the layout of interior spaces, which do not adversely affect any structural member, any part of the structure having a required fire-resistance rating, or the public safety, health or welfare, and which do not involve the practice of architecture and engineering as defined by D.C Official Code §§ 47-2853.61 and 47-2853.131 (2015 Repl. & 2018 Supp.), shall be deemed to comply with this section when such plans are prepared, signed and sealed by an interior designer licensed and registered in the District of Columbia in accordance with D.C Official Code § 47-2853.101 (2015 Repl. & 2018 Supp.).

106.4.4 Exemptions. The professional services of a licensed architect, professional engineer or interior designer are not required for the following:

1. Work done under any of the exemptions from registration provided for in the laws of the District of Columbia governing the licensure of architects, professional engineers and interior designers.
2. Nonstructural alteration of any building of Group R-3 occupancies or of any *building* under the jurisdiction of the *Residential Code*.
3. Preparation of drawings or details for cabinetry, architectural millwork, furniture, or similar interior furnishings, for any work to provide for their installation or for any work exempt from permit by Section 105.2.
4. Drawings or details for the installation of water and sewer *building* connections to a single family residential structure prepared by a master plumber licensed pursuant to D.C Official Code §§ 47-2853.121 *et seq.* (2015 Repl. & 2018 Supp.).

106.4.5. Registered design professional in responsible charge. The *code official* is authorized to require the *owner* to engage and designate on the permit application a *registered design professional* who shall act as the *registered design professional in responsible charge*. If the circumstances require, the *owner* shall designate a substitute

registered design professional in responsible charge who shall perform the duties required of the *original registered design professional in responsible charge*. Where a *registered design professional in responsible charge* is required, the *code official* shall be notified in writing by the *owner* if the *registered design professional in responsible charge* is changed or is unable to continue to perform the duties. The *registered design professional in responsible charge* shall be responsible for reviewing and coordinating submittal documents prepared by others, including phased and deferred submittal items, for compatibility with the design of the *building*.

106.4.6 Attestations required.

106.4.6.1 Registered design professional. The signature and seal of the *registered design professional*, where required by and in accordance with Section 106.4, shall serve as attestation of the following:

1. For architects: "I am responsible for determining that the architectural designs included in this application are in compliance with all relevant laws and regulations of the District of Columbia. I have personally prepared, or directly supervised the preparation of, the architectural designs included in this application."
2. For engineers: "I am responsible for determining that the engineering designs included in this application are in compliance with all relevant laws and regulations of the District of Columbia. I have personally prepared, or directly supervised the preparation of, the engineering designs included in this application."

106.4.6.2 Registered design professional in responsible charge. Where the *code official* determines that a *registered design professional in responsible charge* is required for any project, an attestation sealed and signed by the *registered design professional in responsible charge* engaged by the *owner* shall be submitted prior to the issuance of any and all *certificate(s) of occupancy* for the project. The attestation shall identify the *registered design professional in charge* by name and registration number, shall identify the project or portion thereof being attested to, and shall state, to the *code official's* satisfaction, that the project or portion thereof has been completed in a manner that is substantially compatible with the design of the building that was the basis of the corresponding permit. Furthermore, the attestation shall state that changes from such permit documents, including but not limited to submittal documents prepared by others during the course of construction, and phased and deferred submittal items, have been reviewed and coordinated by the attesting *registered design professional in responsible charge*.

106.5. Examination of documents. The *code official* shall examine or cause to be examined the submittal documents accompanying permit applications, pursuant to Section 105.3.

106.5.1 Review by other agencies. Permit applicants shall be responsible for obtaining any required approvals from other reviewing agencies and entities, including, but

not limited to, the Historic Preservation Office, the Historic Preservation Review Board, the District Department of Energy & Environment, the Public Space Committee, the District Department of Transportation, the Commission on Fine Arts, the Chinatown Steering Committee, and DC Water. If deficiencies in the plans or other supporting documents are discovered during reviews by other agencies, the other reviewing agencies shall respond according to the procedures set forth in its rules and/or procedures. Any restrictions or conditions imposed by other reviewing agencies may be annotated on the plans and shall be incorporated into and deemed a condition of the permit.

106.6 Conformance to approved construction documents. All work shall conform to the *approved construction documents* and any *approved* amendments to them. Any changes made during construction that are not in compliance with the *approved construction documents* shall be submitted to the *Department* for approval as an application for permit revision in accordance with Sections 105.9 and 105.9.1.

SECTION 107 TEMPORARY STRUCTURES AND USES

107.1 General. The *code official* is authorized to issue a permit to construct temporary *structures*, tents and other membrane *structures* in accordance with Section 3103 and Section 3103 of the *Fire Code*. Such permits shall be limited as to time of service, not to exceed 180 days. The *code official* is authorized to grant extensions for demonstrated cause.

107.2 Temporary uses. A temporary certificate of occupancy shall be obtained, in accordance with Section 110.4.4, for temporary use and occupancy of: (1) temporary *structures*, tents and other membrane *structures*; and (2) *existing buildings*, *existing structures* or *lots*.

107.3 Temporary utility services. Utility connections for temporary *structures* shall be in accordance with Section 119.2.

107.4 Termination of approval. The *code official* is authorized to order a temporary structure to be *razed*, or removed or a temporary use to be discontinued, as applicable, where the associated permit and/or certificate has expired. Revocation of permits for temporary *structures*, tents and other membrane *structures*, and revocation of temporary certificates of occupancy shall be governed by Section 111.

SECTION 108 FEES

108.1 Payment of fees. A permit shall not be issued until all required fees have been paid to the *Department* or other authorized agency, nor shall an amendment to a permit requiring an additional fee be issued until the additional fee has been paid.

108.1.1 Application filing deposit for new construction and alterations. All permit applications filed for new construction or alterations must be accompanied by a deposit of 50 percent of the permit valuation determined in accordance with Sections 108.2 and 108.3; provided, that the

required deposit shall not exceed twenty thousand dollars (\$20,000).

108.1.2 Accounting. The *code official* shall keep an accurate account of all fees collected, and such collected fees shall be deposited with the DC Treasurer, or otherwise deposited as required by law.

108.2 Code official authority. The *code official* is authorized to establish by *approved* rules a fee for each permit, certificate or authorization issued by the *Department*, as prescribed in a fee schedule adopted in accordance with Section 108.2.1, for *buildings* and other *structures* and for their appurtenant systems, fixtures, appliances and equipment. The *code official* is authorized to establish fees based on cost of the proposed work or to use alternate methodologies including, but not limited to, the square footage of the project.

108.2.1 Fee schedule. Fees for permit processing, inspections and related services, including, but not limited to, fees for processing and issuance of certificates of occupancy, shall be established by the *code official* in a fee schedule published in the *DC Register*, as amended from time to time.

108.3 Building permit valuations based on cost of work. Where a permit fee is based on cost of work, the applicant for a building permit shall provide an estimated cost of the proposed work at time of application, or such other information as the *code official* specifies, for purposes of establishing a permit valuation. Cost of the proposed work shall be based upon (a) total value of materials and labor for which the permit is being issued, including electrical, gas, mechanical, plumbing equipment and permanent systems; or, (b) at the *Department's* discretion, the most current edition of the National Building Cost Manual or comparable standard. The total cost shall not include architectural, engineering, and other associated professional costs. If, in the opinion of the *code official*, the cost of proposed work is underestimated on the application, the permit shall be withheld, unless the applicant can show detailed estimates to meet the approval of the *code official*. Final building permit valuation shall be determined by the *code official*. Acceptable evidence of the estimated cost of the proposed work shall include any of the following:

1. A fully executed construction contract.
2. A formal contractor's estimate.
3. When a deferred method of determining construction cost is submitted, the *code official* is authorized to request from the applicant a certified contractor's certificate of payment showing the actual cost of construction and the *code official* is authorized to adjust the *building* permit fee to reflect the actual cost of construction prior to issuing a certificate of occupancy.
4. A construction estimate for repairs and alterations in Group R-3 and *structures* under the jurisdiction of the *Residential Code*.
5. The cost based on national standards for construction costs, as modified for the District of Columbia region, as set forth in the most current edition of the National Building Cost Manual or comparable standard.

108.4 Fees associated with work commencing before permit issuance. Any *person* who commences any work on a *building*, other structure, gas, electrical, mechanical or plumbing system before obtaining the necessary permits shall be subject to an additional fee established in the official fee schedule that shall be in addition to the required permit fees and any fines that may have been levied.

108.5 Related fees. The payment of the fee for the construction, *alteration*, removal, *raze* or demolition for work done in connection to or concurrently with the work authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law; or any other privileges, services or requirements, allowed or prescribed by law.

108.6 Refunds. The *code official* is authorized to establish a refund policy.

108.7 Waiver of fees. No person or entity shall be entitled to a waiver of fees, except as set forth in the License Fees and Charges Act of 1976, effective September 14, 1976 [DC Law 1-82; DC Official Code § 47-2712 (2015 Repl. & 2018 Supp.)].

SECTION 109 INSPECTIONS

109.1 General. Construction or work for which a permit is required shall be subject to inspection by the *code official* pursuant to the provisions of this section and Section 104.6. It shall be the duty of the permit holder to cause the construction or work to remain accessible and exposed for inspection purposes until *approved*. The permit holder shall be liable for any expenses entailed in the removal or replacement of any material required to allow inspection. Approval as a result of an inspection shall not be construed to be an approval of a violation of the provisions of the *Construction Codes* or of other laws or regulations of the District of Columbia. Regardless of whether the *code official* inspects the construction or work, it is the responsibility of the permit holder and the individual or entity doing the work to comply with all applicable provisions of the *Construction Codes*.

109.1.1 Preliminary inspection. Before issuing a permit, the *code official* is authorized to examine or cause to be examined all *premises* for which a permit application has been filed.

109.1.2 Termination of an inspection. The *code official* is authorized to terminate an inspection where interference with an inspection occurs or where the *code official* determines that the work is not sufficiently accessible and exposed for inspection.

109.1.3 Identification of general contractor or construction manager. No inspection by the *code official* will be scheduled unless and until the applicant has complied with the requirements of Section 105.3.2(8).

109.1.4 Master tradesperson to be on-site during inspections. The master tradesperson to whom a trade permit is issued, or the District of Columbia licensed representative of the master tradesperson, shall be present during the rough-in inspection for the specific scope of

work performed under the trade permit. The *code official* shall have the authority to require the master tradesperson to be present during any subsequent inspections of the same work where there is repeated noncompliance with *Construction Code* provisions.

109.2 Required inspections and testing. The permit holder shall be responsible for notifying the *code official* when the stages of construction are reached that require any inspection under Section 109 and for other critical items as directed by the *code official*. Upon notification, the *code official* shall make the inspections specified in Section 109 and such other inspections as necessary, and shall either approve that portion of the construction or shall notify the permit holder of any violations that shall be corrected. The *code official* shall not be responsible for conducting inspections unless appropriately notified. The *code official* shall respond to inspection requests without unreasonable delay. It shall be the duty of the *person* requesting any inspections required by the *Construction Codes* to provide access to and means for inspection of such work.

109.2.1 Inspection record. Work requiring a permit shall not be commenced until the permit holder or an agent of the permit holder maintains on the job site an inspection record card or other *approved* documentation issued by the *code official*. Such inspection record document shall be made available by the permit holder on the job site until final inspection approval has been granted by the *code official*. Only an inspector authorized by the *Department* shall document inspections conducted. Any entry on the inspection record document made by a person other than an authorized inspector shall be grounds for revocation of the permit in accordance with Section 111.

109.2.2 Approval Required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the *code official*. The *code official* shall approve the work or portion thereof that is satisfactory as completed, and, where applicable, shall notify the permit holder or an agent of the permit holder that the work or any portion thereof fails to comply with the *Construction Codes*. Any portions that do not comply shall be corrected and such portions shall not be covered or concealed until authorized by the *code official*.

109.3 Types of inspections. After issuing a permit, the *code official* shall conduct the types of inspections specified in Section 109 as deemed necessary by the *code official* and shall confirm submission of documents required by this section and Section 109.4, during and upon completion of the work. A record of all such inspections and of all noted violations of the *Construction Codes* shall be maintained by the *code official*.

109.3.1 Building inspections.

109.3.1.1 Footing and foundation inspections. Footing and foundation inspections are required in accordance with Sections 109.3.1.1.1 and 109.3.1.1.2.

109.3.1.1.1 Footing inspections. Footing inspection is required after excavation for footings is complete and any required reinforcing steel is in place. For concrete footings, any required forms shall be in

place prior to inspection. Materials for the footing shall be on the jobsite at the time of inspection, except where concrete is ready mixed in accordance with ASTM C94, the concrete need not be on the jobsite.

109.3.1.1.2 Foundation inspections. Foundation inspection is required after approval of footings, for location of walls and columns with respect to footings, piles and piers. For concrete foundations, any required forms, spacers and reinforcement shall be in place prior to inspection. Inspections will include materials, concrete cover, anchoring and dimensions, as appropriate.

109.3.1.1.3 Energy footing and foundation insulation inspection. Inspection of installation is required for insulation R-value, location, thickness, depth of burial and protection at footing, foundation, and under floor prior to covering of the materials.

109.3.1.2 As-built foundation survey (wall check). A wall check survey is required before a wall reaches a height of 1 foot (305 mm) above grade, or, in the case of other vertical construction, when a template or form is located and noted. The *code official* is authorized to require up to three wall checks depending on the design of the *structure*: below grade at footer, near grade, and final grade. Surveys, wall examinations and reports, and field notes shall comply with 10-B DCMR §§ 2802, 2810-2812. Wall check surveys shall be performed by a DC-Registered Land Surveyor. Wall check reports, including drawings and field notes, shall be filed with the DC Office of the Surveyor. Surveying practices should comply with standards set forth in the *Manual Of Practices For Real Property Surveying In The District Of Columbia* published by The District of Columbia Association of Land Surveyors (January 2017). Authorization to continue construction of any *building* or other *structure* beyond construction of the foundation shall not be issued until a wall report has been prepared and submitted to the *Department*. The wall report shall confirm that the location and elevation of the *building* or other *structure* conform to the *approved* plans and the provisions of the *Construction Codes* and other applicable District of Columbia regulations.

109.3.1.3 Backfill inspection. Backfill inspection is required prior to placement of backfill materials, for inspection of placement and cover of required footing drain tile, wall waterproofing, drainage and insulation. Backfill materials shall be on the jobsite at the time of inspection.

109.3.1.4 Concrete slab or under-floor inspection. Concrete slab inspections are required after in-slab or under-floor reinforcing steel is in place to verify reinforcement size, spacing, concrete cover, splicing, vapor barrier, and mesh. For slab-on-grade foundations, any required forms shall be in place prior to inspection. Energy footing and foundation insulation inspection, in

accordance with Section 109.3.1.1.3, is required prior to concrete slab or under-floor inspection.

109.3.1.5 Floodplain elevation certificate. For any work subject to Appendix G, upon placement of the *lowest floor*, and prior to proceeding with construction above that floor level, the *elevation certificate* required by Section 1612.5, shall be submitted to the *code official*. This certificate shall be reviewed and *approved* by the *Floodplain Administrator* before construction above the *lowest floor* proceeds, and any such construction before such review and approval is had shall be at the permit holder's risk. Approval by the *Floodplain Administrator* of the *elevation certificate* must be received by DCRA prior to the scheduling and performance of any subsequent inspections required by Section 109.

109.3.1.6 Precladding inspections. Inspections in accordance with Sections 109.3.1.6.1 and 109.3.1.6.2 are required, as applicable, prior to placement of exterior cladding.

109.3.1.6.1 Exterior wall sheathing inspection. Inspection is required, for sheathing materials and nailing patterns, prior to covering the sheathing with any material, such as exterior insulation, *water-resistive barrier*, or air barrier.

109.3.1.6.2 Water-resistive barrier inspection. Inspection is required for *water-resistive barrier* material and installation, prior to application of exterior insulation, roofing materials or exterior wall cladding, veneer or finishes.

109.3.1.7 Framing inspection. Framing inspections are required for interior and *exterior walls*, floor-ceiling and roof-ceiling assemblies. Inspections shall be performed after the framing and bracing of the respective assemblies has been completed, including but not limited to framing of walls, *shaft walls*, *exit* enclosures, elevator hoistways, floor-ceiling assemblies, roof assemblies and roof sheathing. Framing inspections shall be performed before *thermal envelope* interior insulation is applied. Framing inspections shall not be approved before the rough-in inspections of electrical, plumbing, gasfitting and mechanical work have been *approved*.

109.3.1.8 Energy Inspections

109.3.1.8.1 Energy primary air barrier inspection. Inspection of installation is required for the primary air barrier prior to covering of the materials in accordance with the provisions of the *Energy Conservation Code*.

109.3.1.8.2 Energy insulation inspection. Inspection of installation is required for the insulation R-value at the building thermal envelope prior to covering of the material. This includes exterior wall, interior wall, roof and attic insulation. Fenestration installed in the building thermal envelope shall be inspected for U-factor and SHGC value. Envelope commissioning documentation shall be provided in

accordance with established guidance upon request of the *code official*. Compliance with relevant building envelope provisions of the *Energy Conservation Code* shall be verified.

109.3.1.9 Inspection of fire-resistance-rated assembly. An inspection is required of fire-resistance-rated assemblies, including, but not limited to, those constructed of *gypsum board* or shaftliner board. This inspection includes assemblies that are part of a fire or smoke-rated wall, a shear wall, a *shaft* wall or a sound attenuation assembly, and shall be performed after the *gypsum board* is in place, but before the outer layer of *gypsum board* joints and fasteners are taped and covered with joint compound. *Shaft* walls constructed with shaftliner shall be inspected on the shaftliner face from three sides of the *shaft*, and from the exterior of the *shaft* on all sides of the *shaft*.

109.3.1.10 Accessibility inspections. Inspections of features affecting accessibility are required at various stages of construction. Building elements such as, but not limited to, required floor clearances, maneuvering clearances, *ramp* slopes, grab bar wall reinforcements, shall be inspected when construction is ready for framing or rough-in inspections. Features such as, but not limited to, required signage, reach ranges, floor surfaces, thresholds and mounting heights shall be inspected when construction is ready for final inspections. All accessibility inspections shall be performed prior to the final building inspection.

109.3.1.11 Final building inspection. A final building inspection is required after all other required building inspections are approved, and after any associated final inspections, acceptance testing, submissions or reports specified in Sections 109.3.2. through 109.3.13, as applicable, are approved and recorded, and the work for which a permit was issued has been completed in compliance with the *Construction Codes*. This inspection will confirm that each relevant system and component has successfully undergone a final acceptance testing or inspection, and that the life safety related items, as installed, perform or operate as intended and the *premises* are deemed safe to occupy. This inspection will also confirm, among other things, that:

1. The required *means of egress* are compliant and unobstructed through the *exit discharge*.
2. The required signage is appropriately posted.
3. Opening protective ratings are correct.
4. Installed handrails and hardware are compliant.
5. The permit holder has complied with Sections 109.3.1.11.1 and 109.3.1.11.2, as applicable.

109.3.1.11.1 Flood hazard documentation. For work subject to Appendix G, a final building inspection shall not be *approved* unless the permit holder has complied with the requirements of either of the following, as applicable:

1. An *elevation certificate* shall be submitted to the *code official* and reviewed and approved

by the *Floodplain Administrator* documenting the as-built elevation of the *lowest floor* as required by Section 1612.5.

2. A *floodproofing certificate* shall be submitted to the *code official* and reviewed and approved by the *Floodplain Administrator* prior to either (a) the final inspection, or (b) the issuance of a certificate of completion or the first certificate of occupancy for a occupied space at grade or above, whichever is earlier, to certify a floodproofing design for a nonresidential building that is permitted as an alternative to elevating to or above the *base flood elevation*.

109.3.1.11.2 Addressing. A final building inspection shall not be approved unless the *premises* complies with the applicable addressing requirements in Section 118.

109.3.2 Electrical inspections.

109.3.2.1 Underground and slab inspection. Inspection is required after trenches or ditches are excavated, forms are erected, conduit or cable are installed, and before any backfill or concrete is placed.

109.3.2.2 Service inspection. Inspection of each new or upgraded electrical service is required before the service entrance equipment is authorized to be energized.

109.3.2.3 Rough-in inspection. Inspection is required after the framing, fire blocking, and fire stopping are in place, after all circuit wiring, outlet boxes and luminaires are roughed-in, and prior to the installation of insulation and wall and ceiling membranes.

109.3.2.4 Energy rough-in inspection. Inspection is required after all circuit wiring, outlet boxes and luminaires are roughed-in, and prior to the installation of insulation and wall and ceiling membranes. Inspection of installation is required for the wiring of controls and other electrical provisions of the *Energy Conservation Code*.

109.3.2.5 Energy final inspection. Inspection is required after completion of all the electrical work planned or required on the *premises* for which a permit was issued. Inspection of installation is required for lighting efficacy, lighting controls, and other electrical provisions of the *Energy Conservation Code*.

109.3.2.6 Final electrical inspection. A final electrical inspection is required after completion of all the electrical work planned or required on the *premises* for which a permit was issued, to confirm that all required electrical outlets, switches, luminaires and equipment are in place and properly connected and protected.

109.3.3 Plumbing inspections.

109.3.3.1 Underground and slab inspection. Inspection is required after trenches or ditches are excavated, forms are erected, and piping is installed, and before any backfill or concrete is placed. Drainage piping shall be inspected for appropriate size and slope, and all piping to be buried or embedded shall be tested for leaks

under appropriate hydrostatic pressure in accordance with Sections 312.2 and 312.5 of the *Plumbing Code* and corresponding provisions of the *Residential Code* if applicable. Inspection of water and sewer laterals to the point of connection to the public mains is also required.

109.3.3.2 Rough-in inspection. Inspection is required prior to the installation of insulation and wall and ceiling membranes, after the framing, fire blocking and fire stopping are in place, and after water, soil, waste and vent piping is complete. All piping systems, whether to be concealed or not, shall be tested for leaks under appropriate hydrostatic pressure, in accordance with Sections 312.2 and 312.5 of the *Plumbing Code* and corresponding provisions of the *Residential Code* if applicable, before installation of any concealing materials.

109.3.3.3 Energy rough-in inspection. Inspection is required after the installation of pipe insulation. Inspection of installation is required for plumbing pipe insulation and other plumbing provisions of the *Energy Conservation Code* prior to covering of the material or equipment

109.3.3.4 Water service pipe inspection. Domestic water service pipe installation inspection is required for pipe size, materials, trenching and bedding, from the public water main tap to the water distribution system of the premises, prior to backfilling the trench.

109.3.3.5 Building sewer pipe inspection. Inspection of installation of sanitary, storm and combined building sewer, as applicable, is required for pipe size, materials, slope, trenching and bedding, from the building drain to the public sewer serving the premises, prior to backfilling the trench.

109.3.3.6 Water Service flush inspection. Domestic water service pipe flush inspection is required prior to connection of the service to the water distribution system of the premises, to witness the removal of debris in the water service line.

109.3.3.7 Energy final inspection. Inspection is required after the work for which a permit was issued has been completed, all plumbing fixtures and equipment are in place and properly connected, and all the plumbing work to be done in the structure, building, or portion thereof is completed. Inspection of installation is required for plumbing controls and other plumbing provisions of the *Energy Conservation Code*.

109.3.3.8 Final plumbing inspection. Final plumbing inspection is required after the work for which a permit was issued has been completed, all plumbing fixtures and equipment are in place and properly connected, and all the plumbing work to be done in the structure, building or portion thereof is completed.

109.3.4 Mechanical inspections.

109.3.4.1 Underground and slab inspection. Inspection is required after trenches or ditches are excavated, forms are erected, underground duct or fuel piping is installed, and before any backfill and/or concrete is placed.

109.3.4.2 Rough-in inspection. Inspection is required prior to the installation of wall and ceiling membranes, and after the roof, framing, fire blocking and bracing are in place and all duct and fuel piping to be concealed are complete.

109.3.4.3 Energy rough-in inspection. Inspection is required prior to the installation of wall and ceiling membranes, and after all duct to be concealed are complete. Inspection of installation is required for duct insulation, ventilation strategy, and other mechanical provisions of the *Energy Conservation Code*. The rough-in duct leakage test results shall be provided. Systems commissioning documents shall be provided in accordance with established guidance upon request of the code official.

109.3.4.4 Commercial kitchen hood and duct inspections. Inspection is required after a commercial kitchen hood and associated exhaust duct have been installed.

109.3.4.4.1 Grease duct inspection. This inspection shall be performed before concealing any portion of the grease duct, and shall include, but not be limited to, inspection of duct joints and witnessing of a grease duct leakage test in accordance with Section 506.3.2.5 of the *Mechanical Code*.

109.3.4.4.2 Kitchen exhaust hood inspection. This inspection shall be performed after connecting the hood to the grease duct, and shall include, but not be limited to, inspection of the connection between hood and duct, and of any required grease duct enclosure installation, in accordance with Section 506.3.11 of the *Mechanical Code*. This inspection is in addition to the commercial kitchen exhaust hood testing required by Section 109.3.7.6.

109.3.4.5 Energy final inspection. Inspection is required after the work for which a permit was issued has been completed, the mechanical systems and appliances are in place and properly connected. Inspection of installation is required for HVAC system sizing, ventilation strategy controls, and other mechanical provisions of the *Energy Conservation Code*. If not provided for in Section 109.3.4.3, Energy Rough-in Inspection, the post construction duct leakage test report shall be provided. Systems commissioning documents shall be provided in accordance with established guidance upon request of the code official.

109.3.4.6 Final mechanical inspection. A final mechanical inspection is required after the work for which a permit was issued has been completed, the mechanical systems and appliances are in place and properly connected and all work regulated by the *Mechanical Code* (or corresponding provisions of the *Residential Code*, if applicable) to be done on the premises is completed.

109.3.5 Fuel gas inspections.

109.3.5.1 Rough-in inspection. Inspection is required after all piping authorized by the permit has been installed and before any such piping has been covered

and concealed or any fixtures or appliances have been connected. This inspection shall include witnessing a test and performing an inspection of the gas piping systems, in accordance with Section 406 of the *Fuel Gas Code* and corresponding provisions of the *Residential Code*, if applicable.

109.3.5.2 Final fuel gas inspection. A final inspection is required after all fuel gas work for which a permit was issued has been completed.

109.3.6 Elevators, escalators and other conveying systems inspections. Prior to operation of an elevator, escalator or other conveying system that has been installed or altered pursuant to a permit, a final inspection and issuance of a certificate of inspection shall be required in accordance with Section 3009.3.

109.3.7 Fire Protection systems inspections.

109.3.7.1 Fire alarm systems rough-in. Inspection of fixed portions of fire detection and alarm systems, whether to be concealed or not, is required before installation of any concealing materials for inspection of wiring methods and supports.

109.3.7.2 Fire suppression systems pressure testing and inspection. Before installation of any concealing materials, or painting of any piping or fittings, an inspection is required of all portions of fire suppression systems piping, whether to be concealed or not. This inspection shall include, but not be limited to, the materials installed, the method of installation, clearances and supports, the location of sprinklers or nozzles, and the witnessing of pressure tests with appropriate testing media, to detect leaks. Where water-based suppression systems have to be tested with gas or air, an additional hydrostatic test shall be performed and witnessed in accordance with Section 903.5 of this code and Section 901.5 of the *Fire Code*, as soon as temperature conditions allow it.

109.3.7.3 Fire service flush inspection. Fire service flush inspection is required prior to connection of the service, to any portion of the fire pump or sprinkler system piping, to witness the removal of debris in the fire service line.

109.3.7.4 Fire pump inspection. Before final inspection of a water-based fire suppression system, where a new or replacement fire pump assembly is installed, a fire pump inspection is required for proper installation, initiation and operation, under normal and backup power, to verify that appropriate pressure and flow are achieved. This inspection shall include witnessing an acceptance test of the pump in accordance with the relevant standard.

109.3.7.5 Fire suppression systems final inspection. Final inspection is required to verify the installation and coverage, and, where appropriate, proper operation of each fire suppression system. Where appropriate, this inspection shall include witnessing the testing of system discharge control devices under the relevant standard.

109.3.7.6 Kitchen hood and duct fire suppression systems final acceptance testing. Final acceptance testing is required of work for which a permit has been issued to confirm proper installation, coverage and operation of fire suppression systems. This acceptance testing shall include witnessing the testing of system discharge control devices, as appropriate, under the relevant standards.

109.3.7.7 Fire alarm systems final acceptance testing. Final acceptance testing is required of any work on a fire detection and alarm system for which a permit has been issued to confirm proper initiation, notification, annunciation and operation of the system. This acceptance testing shall include witnessing an acceptance test of the system in accordance with the relevant standard.

109.3.8 Energy final inspection. A final energy inspection is required after the work for which a building permit was issued has been completed and all the mechanical, plumbing, electrical and building envelope systems have been installed and programmed, to ascertain compliance of the project with the relevant provisions of the *Energy Conservation Code*. The building air leakage test results shall be provided to the *code official*.

109.3.9 Green Building inspections. Where the *Green Construction Code* applies, the following green building inspections are required.

109.3.9.1 Green demolition inspection. Inspection is required for material resource conservation, efficiency, and indoor environmental air quality at the time of indoor air quality plan implementation but prior to starting construction activities likely to produce dust or odors. The green demolition inspection is applicable to all projects subject to the *Green Construction Code* performing demolition.

109.3.9.2 Green rough-in inspection. Inspection is required for site development, material resource conservation, energy conservation, water resource conservation, and indoor environmental quality at the time of first insulation inspection in accordance with Section 109.3.1.9 and after mechanical, electrical, and plumbing rough-in inspections. Inspection is required prior to the covering of the materials or equipment. A green rough-in inspection is not required if the project is only performing demolition.

109.3.9.3 Green final inspection. Inspection is required for site development, material resource conservation, energy conservation, water resource conservation and indoor environmental quality prior to the final building inspection in accordance with Section 109.3.1.11. A green final inspection is not required if the project is only performing demolition.

109.3.10 Boiler and pressure vessel inspections. A boiler or pressure vessel inspection is required prior to operating a new or altered boiler or pressure vessel. This final inspection shall be performed to confirm that the boiler or pressure vessel has been installed or altered in compliance with the *Mechanical Code* and the conditions

of its installation permit. This final inspection and issuance of a certificate of inspection are required pursuant to Section 1003.2 of the *Mechanical Code*.

109.3.11 Other inspections. In addition to the inspections specified above, the *code official* is authorized to make, or to require the owner of a *building* or other *structure* to have an independent inspection agency perform, other inspections of any construction work. These inspections shall ascertain compliance with the provisions of the *Construction Codes*, the *Zoning Regulations* and other laws or regulations that are enforced by the *Department*.

109.3.12 [Reserved]

109.3.13 Special inspections. Special inspections shall be made in accordance with Chapter 17 of this code, the *Third-Party Program Procedure Manual* published by the *Department*, and the *Special Inspections Procedural Manual* published by the *Department*.

109.3.13.1 Authority to require special inspections.

The *code official* is authorized to require the *owner* to employ special inspectors having adequate qualifications for inspection or supervision of the types of construction in accordance with Chapter 17 of this code, the *Third-Party Program Procedure Manual* and the *Special Inspections Procedural Manual*.

109.3.13.2 Final Report of special inspections. In order to obtain a final building inspection and/or Certificate of Occupancy, a final report of Special Inspections must be submitted to the *code official* after review and approval by the Special Engineer of Record in accordance with the requirements of the *Third-Party Program Procedure Manual* and the *Special Inspections Procedural Manual*.

109.3.13.3 Inspection at point of manufacture or fabrication. When required by the provisions of the *Building Code*, materials or assemblies shall be inspected at the point of manufacture or fabrication in accordance with Sections 1704.2.5 and 1704.2.5.1, and the *Special Inspections Procedural Manual*.

109.3.14 Certificates authorizing use and occupancy of premises or portion thereof. The *code official* is authorized to conduct an inspection upon submission of an application for a Certificate required by Section 110, to confirm that work authorized by a permit has been completed in compliance with the *Construction Codes*, and the proposed use and occupancy or both complies with all applicable provisions of the *Construction Codes* and *Zoning Regulations*.

109.4 Inspections of permitted work by third-party agencies.

109.4.1 Authorization to use a third-party agency. When approved by the *Department*, a permit holder, at the permit holder's expense, shall have the option of having a *third-party agency* conduct the inspections required by Section 109.3 for work subject to a permit issued by the *Department*. The *third-party agency* must be pursuant and subject to the provisions of DC Official Code § 6-1405 (2018 Repl.), Section 109.4, and the *Third-Party Program*

Procedure Manual (the provisions of which are incorporated herein by reference). Where the *Department* approves the use of a *third-party agency* the *third-party agency* shall provide and perform inspection services of the work for which a permit has been issued by the *Department* in accordance with DC Official Code § 6-1405, this section, and the provisions of the *Third-Party Program Procedure Manual*.

109.4.1.1 Special inspections. Special inspections shall be governed by Section 109.3.13 and Chapter 17 of the *Building Code*, the *Third-Party Program Procedure Manual* and the *Special Inspections Policy Manual*.

109.4.2 Procedures for inspections by third-party agencies. Where inspections are to be conducted by one or more approved *third-party agencies* of work subject to any permit issued by the *Department*, the *third-party agency* shall comply with the provisions of the *Third-Party Program Procedure Manual*.

109.5 Right of entry. The *code official's* right of entry shall be governed by Section 104.6.

109.6 Coordination of inspections. Whenever, in the enforcement of the *Construction Codes* or another law or regulation, the responsibility of more than one official of the District of Columbia is involved, it shall be the duty of the officials involved to coordinate their inspections and administrative orders as fully as practicable so that the *owner* and occupants of the *premises* are not subjected to multiple visits by numerous inspectors or multiple or conflicting orders.

SECTION 110

LETTERS OF CORE AND SHELL COMPLETION AND CERTIFICATES AUTHORIZING OCCUPANCY AND USE OF PREMISES

110.1 General. Section 110 provides procedures and requirements for the following:

1. Letters of Core and Shell Completion;
2. Certificates of Occupancy;
3. Single-family Certificates of Completion;
4. Conditional Certificates of Occupancy; and
5. Temporary Certificates of Occupancy.

For purposes of Section 110, the term "Certificate" shall collectively refer to all of the certificates identified in Items 2 through 5 above.

110.2 Letter of Core and Shell Completion. The *code official* is authorized to issue a Letter of Core and Shell Completion in accordance with the provisions of Section 110.2 for construction, whether involving newly constructed or existing *buildings*, where the *code official* determines that the *building's* core and shell are substantially complete in accordance with the *Construction Codes*. The issuance of a Letter of Core and Shell Completion under this section shall not authorize or be deemed to authorize the use or occupancy of any portion of a *premises* or portion thereof for which a Certificate is required. The core and shell shall include any ele-

ments, systems and components that the *code official* shall designate.

110.2.1 Applications for a Letter of Core and Shell Completion. All applications for a Letter of Core and Shell Completion shall be filed with the *Department* on the prescribed forms provided by the *code official*, shall be accompanied by the prescribed filing fee paid at the time of the application, and shall include the following:

1. A list of permit numbers for all valid, associated permit(s) that authorized the construction for which the Letter of Core and Shell Completion is sought.
2. Where the *premises* is located wholly or partially within a *flood hazard area*, the as-built elevation certificate or flood-proofing certificate required by Appendix G, as applicable.
3. Other information as the *code official* shall require.

110.2.2 Additional requirements for action on applications for Letters of Core and Shell Completion. Prior to issuance of a Letter of Core and Shell Completion, the *code official* shall conduct inspections pursuant to Section 109.3.8 to confirm compliance with the applicable *Construction Codes*, and shall obtain review and approval by the *Floodplain Administrator* if the *premises* are located wholly or partially within a *flood hazard area*.

110.2.3 Issuance of Letter of Core and Shell Completion. The *code official* shall review applications for Letters of Core and Shell Completion which are complete, and shall approve such applications and issue a Letter of Core and Shell Completion upon a finding that the application satisfies the requirements of Sections 110.2, 110.2.1 and 110.2.2., and other applicable provisions of the *Construction Codes*. The Letter of Core and Shell Completion issued by the *Department* shall contain all of the following information:

1. The address of the *premises*, along with the *lot* and square number.
2. The name and address of the *owner*.
3. A description of the *premises* or portion of the *premises* for which the Letter of Core and Shell Completion is issued.
4. The permit number(s) associated with the Letter of Core and Shell Completion (if applicable).
5. The type of construction as defined in Chapter 6 of this code.
6. The edition of the *Construction Codes* under which the permit(s) were issued.
7. List of all building elements, systems and components encompassed by the Letter of Core and Shell Completion and any special stipulations and conditions.
8. The name of the *code official*.
9. The date of issuance.

110.3 Required Certificates authorizing use and occupancy of a premises or portion thereof. Until a Certificate authorizing the use and occupancy of the *premises* or portion thereof in accordance with Sections 110.3 and 113.4 has been

issued by the *code official*, no *person* shall use or occupy any *premises* or any portion thereof for any purpose, and no change in the existing use, occupancy classification, occupancy load, tenant floor layout or ownership of a *premises* or portion thereof shall be made for any purpose. The issuance of a Certificate shall not be construed as an approval of a violation of the provisions of the applicable *Construction Codes* or *Zoning Regulations* or of the provisions of other laws or regulations of the District.

Exceptions:

1. One-family *dwellings* (including *congregate living facilities* with six or fewer residents) in existence on the effective date of the *Construction Codes*.
2. Repairs or *alterations* (Level 1 or Level 2) to one-family *dwellings* (including *congregate living facilities* with six or fewer residents).
3. Transfer of ownership of a one-family *dwelling* (including *congregate living facilities* with six or fewer residents) in itself does not require a new certificate.

110.4 Code official authority to issue certificates. The *code official* is authorized to issue the following Certificates authorizing use and occupancy of a *premises*, or portion thereof, in accordance with the requirements of Sections 110.4 through 110.6:

1. Certificate of Occupancy.
2. Single-family Certificate of Completion.
3. Conditional Certificate of Occupancy.
4. Temporary Certificate of Occupancy.

110.4.1 Certificate of Occupancy. The *code official* is authorized to issue a Certificate of Occupancy where the *code official* determines that all of the following have been met:

1. Work pursuant to a permit has been completed.
2. A satisfactory final inspection has been *approved* in accordance with Section 109.3.1.11.
3. The construction conforms substantially to the permit including *approved construction documents* and to the provisions of the *Construction Codes*, the *Zoning Regulations* and other applicable laws and regulations.
4. The *owner* has complied with the requirements of Section 110.5.

110.4.2 Single-family certificate of completion. Where the *code official* determines that the conditions of Section 110.4.1 are satisfied, the *code official* has authority to issue a Single-family Certificate of Completion in the following circumstances:

1. One-family *dwellings* (including *congregate living facilities* with six or fewer residents) constructed after the effective date of the *Construction Codes*.
2. Additions or Level 3 *alterations* to existing one-family *dwellings* (including *congregate living facilities* with six or fewer residents) completed after the effective date of the *Construction Codes*.

110.4.3 Conditional Certificate of Occupancy. The *code official* is authorized to issue a Conditional Certificate of Occupancy to authorize the conditional use and conditional occupancy of a *premises*, or a portion thereof, for which construction has begun but not been completed pursuant to a valid permit where all of the following conditions are met:

1. The *code official* has determined that the portion of the *premises* for which the Conditional Certificate of Occupancy is requested may be safely occupied notwithstanding that the work authorized by the permit has not been completed. A *building* will not be deemed safe for occupancy unless, at a minimum, the following are in place for the areas being occupied: adequate light, ventilation and sanitation; *means of egress*, *fire protection systems*, *primary structural frame* and *secondary members*.
2. A valid Letter of Core and Shell Completion has been issued for the entire *building* or *structure* in which the *premises* or portion thereof for which the Conditional Certificate of Occupancy is requested is located unless the *code official* makes a determination in writing that a Letter of Core and Shell Completion is not required.
3. The proposed occupancy (both as to initial occupancy and subsequent identical occupancies thereafter) complies with all use and occupancy requirements of Chapters 3 and 4 of this code and the applicable *Zoning Regulations*.
4. The *owner* has complied with the requirements of Section 110.5.

The issuance of a Conditional Certificate of Occupancy under this section shall only authorize the use or occupancy of the part of the *premises* specified therein, and shall not authorize or be deemed to authorize the use or occupancy of any other part of the *premises*. A substantial separation will be established and maintained between the area occupied and the areas remaining under construction to prevent noise, pollutants and other unsafe conditions from adversely affecting occupied areas.

110.4.3.1 Authority to impose conditions. The *code official* is authorized to impose conditions on the Conditional Certificate of Occupancy as the *code official* deems necessary to protect the public health, safety, and welfare, including, but not limited to, an expiration date for the Conditional Certificate of Occupancy and a requirement that a single Certificate of Occupancy be obtained for the entire *building* or *structure* upon completion of all phases of the work permitted.

110.4.3.2 Expiration of Conditional Certificate of Occupancy. A Conditional Certificate of Occupancy shall become null and void upon the expiration date specified in the Conditional Certificate of Occupancy without any additional notice or order required by the *code official*. The *code official* is authorized to identify expired certificates in the *Department's* database, or to take any other actions necessary to administer this provision.

110.4.4 Temporary Certificate of Occupancy. The *code official* is authorized to issue a Temporary Certificate of Occupancy, subject to the requirements of Section 110.5, in either of the following circumstances:

1. To authorize the temporary use and temporary occupancy of a temporary structure, tent or membrane structure for which a permit has been issued pursuant to Sections 107.1 and 3103 and/or Sections 3103 and 3104 of the *Fire Code* for a defined period of time not to exceed six months.

Exception: The *code official* has authority to issue a Temporary Certificate of Occupancy for up to 12 months for temporary use and temporary occupancy of a permitted temporary structure, tent or membrane structure, where the use and occupancy occurs intermittently, and for no more than two days per week, and no permanent structure is built.

2. To authorize the temporary use (including a temporary change of use) and temporary occupancy of (a) an existing *building* or *existing structure*, or portion thereof, or (b) a lot (but not any temporary *structures*, tents or membrane *structures* located thereon) for a defined period of time not to exceed 12 months, where the *code official* determines that the *premises*, or designated part thereof, is safe to use and occupy.

The issuance of a Temporary Certificate of Occupancy under this section shall only authorize the use or occupancy of the part of the *premises* specified therein, and shall not authorize or be deemed to authorize the use or occupancy of any other part of the *premises*.

110.4.4.1 Authority to impose conditions. The *code official* is authorized to impose conditions on the Temporary Certificate of Occupancy as the *code official* deems necessary to protect the public health, safety, and welfare.

110.4.4.2. Expiration of temporary Certificate of Occupancy. The *code official* shall specify the expiration date for the Temporary Certificate of Occupancy in the Certificate issued under this section. A Temporary Certificate of Occupancy shall become null and void upon the expiration date specified in the Temporary Certificate of Occupancy without any additional notice or order required by the *code official*. The *code official* is authorized to identify expired certificates in the *Department's* database, or to take any other actions necessary to administer this provision.

110.5 Application for and processing of Certificates. All applications for a Certificate authorizing the use and occupancy of a *premises* or a portion thereof shall be filed with the *Department* on the prescribed forms provided by the *code official*, shall be accompanied by the prescribed filing fee paid at the time of the application, and shall include all of the following:

1. A list of permit number(s) for the valid, associated permit(s) that authorized the construction of the *premises* or portion thereof for which the Certificate is sought

unless the *code official* determines that an associated permit is not required;

2. A copy of the final inspection approval in accordance with Section 109.3.8, unless the *code official* determines that no inspection is required pursuant to Section 110.5.1;
3. For *premises* located in a PDR zone, the “Standards of External Effects” application required by Section U-805 of the *Zoning Regulations*;
4. If an application pertains to a *structure* or use authorized by an order of the Zoning Commission or Board of Zoning Adjustment and the permission granted in that order was made subject to conditions, a copy of the Order and a statement demonstrating compliance with the Order, including all conditions that were to be satisfied prior to the issuance of a Certificate;
5. Where the *premises* is located wholly or partially within a *flood hazard area*, the required elevation certificate or flood-proofing certificate, as applicable, with evidence of review and approval of such certificate by the *Floodplain Administrator*.
6. Any other information required by the *code official*.

110.5.1 Inspections. Following the filing of an application for a Certificate, and as required by the *code official*, inspections shall be conducted pursuant to Section 109.3.14 to confirm compliance with the applicable *Construction Codes* and the *Zoning Regulations*.

Exceptions:

1. Application for issuance of a new Certificate for a *premises* or portion thereof due to a change in ownership or change in tenancy, where the *premises* or portion thereof has an existing valid Certificate, the *code official* is authorized to issue a new Certificate without an inspection. The *code official* is authorized to conduct inspections to confirm that no other changes have been made from the prior Certificate.
2. Application for issuance of a new Certificate for a *premises* or portion thereof that have an existing valid Certificate from which the only change proposed is a change in use, the *code official* is authorized to issue a Certificate without requiring an inspection upon a determination by the *code official* that the change of use or occupant load is not accompanied by any physical changes to the *premises* or portion thereof for which the Certificate is requested. The *code official* is authorized to conduct inspections to confirm that no other changes have been made from the prior Certificate.
3. Application for issuance of a new Certificate for a *premises* or portion thereof that have an existing valid Certificate from which the only change proposed is a change in occupant load, the *code official* is authorized to issue a Certificate without requiring an inspection upon a determination by the *code official* that the change in occupant load

does not require changes to means of egress, plumbing or ventilation requirements. The *code official* is authorized to conduct inspections to confirm that no other changes have been made from the prior Certificate.

4. Changes in occupancy classification as defined in Chapter 3 require a separate permit, and *approved* inspections must be completed prior to issuance of a Certificate for the new occupancy classification.

110.5.2 Zoning review and approval. Prior to issuance of a Certificate, the *code official* shall obtain review and approval by the *Zoning Administrator* to confirm that the proposed use of the *premises*, including accessory uses, complies with the *Zoning Regulations*.

Exception: Approval of the *Zoning Administrator* shall not be required for a Certificate for any use for which the *Zoning Regulations* do not require a Certificate of Occupancy.

110.5.3 Special restrictions for projects subject to Green Building Act and Green Construction Code alternative compliance path.

110.5.3.1 Projects subject to the Green Building Act.

No Certificate of Occupancy shall be issued for a project subject to Section 4 of the Green Building Act (DC Official Code § 6-1451.03) and Section 302 of the *Green Construction Code*, until the owner complies with the financial security requirement of Section 6 of the Green Building Act (DC Official Code § 6-1451.05) or Section 302 of the *Green Construction Code*, as applicable.

110.5.3.2 Projects not subject to the Green Building Act.

For projects electing an alternative compliance pathway pursuant to Section 101.4.9.4.2.2, 101.4.9.4.2.3 or 101.4.9.4.2.4, prior to issuance of a Certificate of Occupancy, or prior to issuance of the first Certificate of Occupancy for occupiable space in a *story above grade plane* where a project has multiple Certificates of Occupancy, the *code official* is authorized to request additional documentation as deemed necessary to confirm that the project is on track to be certified as compliant with the elected pathway.

110.6 Issuance of Certificate authorizing use or occupancy. The *code official* shall review applications for Certificates which are complete, and shall approve such applications and issue the applicable Certificate upon a finding that the application satisfies the requirements of the *Construction Codes*, the *Zoning Regulations*, and other laws or regulations that are enforced by the *Department*. The Certificate issued by the *Department* shall contain all of the following information:

1. The address of the *premises*, along with the lot and square number and the applicable zone district.
2. The name and address of the *owner* or tenant, as applicable.
3. A description of the *premises*, or portion thereof, for which the Certificate is issued.

4. The permit number(s) associated with the Certificate, if applicable.
5. The use and occupancy authorized in accordance with the provisions of Chapters 3 and 4 of this code.
6. The use and occupancy authorized in accordance with the *Zoning Regulations*.
7. The design occupant load.
8. The type of construction as defined in Chapter 6 of this code.
9. If an *automatic sprinkler system* is provided, whether the sprinkler system is required.
10. The edition of the *Construction Codes* under which the permit was issued.
11. Any special stipulations and conditions of the Certificate or the associated permit(s).
12. The name of the *code official*.
13. The date of issuance.
14. The date of expiration, if a Conditional or Temporary Certificate of Occupancy.

Exception: The *code official* is authorized to omit any of the above information upon determination that such information is not necessary or applicable to the specific Certificate.

110.7 Posting of certificate. All Certificates shall be conspicuously posted in or upon the *premises* to which they apply so that they are readily visible to anyone entering the *premises*.

Exceptions:

1. Certificates for places of religious worship are not required to be posted.
2. Certificates are not required to be posted for one-family *dwellings* (including *congregate living facilities* with six or fewer residents).

110.8 Revocation of a certificate. Revocations of any Letter of Core and Shell Completion or Certificate issued pursuant to this section are governed by Section 111.

110.9 Fees for Letters of Core and Shell Completion and Certificates. A fee for the processing and issuance of a Letter of Core and Shell Completion and Certificates shall be paid to the DC Treasurer in accordance with the applicable fee schedule.

110.9.1 Fee schedule. The Director is authorized to establish, from time to time, by *approved* rules, a schedule of unit rates and other fees for Letters of Core and Shell Completion, Certificates and other related miscellaneous services.

SECTION 111

REVOCATION OF PERMITS AND CERTIFICATES

111.1 Revocation of a permit. The *code official* is authorized to revoke in whole or in part any permit issued under

the *Construction Codes* or the *Zoning Regulations* upon service of notice as specified by Section 111.3, for any of the following reasons:

1. Where the *Office of Administrative Hearings* (OAH) or *Board of Zoning Adjustment* (BZA) has issued an order revoking a permit or finding that a permit was issued in error.
2. When the permit holder, contractor, or *Registered Design Professional in Responsible Charge* has been cited, under Section 115 or 116 of this code for one or more violations of the *Construction Codes* which, by the determination of the *code official*, threaten the health and safety of the public in the District of Columbia, and when the permit holder fails to restore safety or otherwise remedy the situation under the terms and conditions of the *code official's* order and within the time period specified.
3. When the *code official* determines that the permit has been erroneously issued as the result of administrative or clerical error and notifies the permit holder of the error within five business days after permit issuance.
4. When the *code official* determines that the permit has been erroneously issued as the result of administrative or clerical error and notifies the permit holder of the error more than five *business days* after permit issuance.
5. When permits are issued to a contractor, construction manager or tradesperson without the requisite District of Columbia license(s) or whose District of Columbia license(s) have expired, or are suspended or revoked by the Board or DCRA Division having jurisdiction.
6. Where the application or *construction documents* on which the issuance of a permit or approval was based contain a significant inaccuracy, a false statement or a material misrepresentation of fact that substantively affected the approval and issuance of the permit, including, but not limited to, inaccuracies with respect to pre-existing conditions.
7. When work at a construction site covered by the permit has been posted with two or more stop work orders, under Section 114, and, where the stop work order is not otherwise withdrawn by the *code official*, the permit holder fails to comply with the terms of the stop work orders in two or more instances, so as to establish a pattern indicative of the permit holder's unwillingness to fully comply with the *Construction Codes*.
8. When the work at a construction site covered by the permit: (a) does not comply with (i) the *Construction Codes* (or any modification duly granted thereunder by the *code official*), (ii) the *Zoning Regulations* (or any relief granted therefrom by the Board of Zoning Adjustment or the Zoning Commission), (iii) the permit, (iv) the revised permit, (v) one or more conditions of any Board of Zoning Adjustment or Zoning Commission Order that authorized the construction,

or (vi) the *approved construction documents*; and (b) the permit holder fails to correct the nonconforming condition within the time period specified in a notice or order issued under Section 113, if such is issued.

9. Where the application or *construction documents* on which the issuance of a permit or approval was based was signed by an architect or engineer without the requisite District of Columbia license(s) or whose District of Columbia license(s) have expired, or are suspended or revoked by the Board or DCRA Division having jurisdiction.
10. Where the *registered design professional* of record or the *registered design professional in responsible charge* has been disciplined by the Board for Professional Engineers or the Board for Architects or any other regulatory authority.

111.1.1 Effective date of permit revocation. Revocation of a permit shall become final upon occurrence of one of the following conditions:

1. Revocations based on Item 1 of Section 111.1 shall be summary revocations that take effect on the effective date of the order of the *OAH* or *BZA*.
2. Revocations based on Item 2 of Section 111.1 shall be summary revocations that take effect on the date ordered by the *code official*.
3. Revocations based on Item 3 of Section 111.1 shall be summary revocations that take effect upon timely issuance by the *code official* of a notice to the permit holder declaring the permit null and void and canceling the permit.
4. All revocations based on Section 111.1 other than those subject to Items 1, 2 or 3 of Section 111.1.1, shall be proposed actions that will take effect upon one of the following conditions:
 - a. If based on violations of the *Construction Codes*, ten *business days* after service of the notice of revocation pursuant to Section 111.3 unless the permit holder requests a hearing to appeal the proposed revocation from the *Office of Administrative Hearings* (OAH) within that 10 *business day* period.
 - b. If based on violations of the *Zoning Regulations*, at the end of the 60-day period established in Section 11-Y 302 of the *Zoning Regulations* for appeals to the *Board of Zoning Adjustment* (BZA), after service of the notice of revocation pursuant to Section 111.3 unless the permit holder requests a hearing to appeal the proposed revocation from the *Board of Zoning Adjustment* (BZA) within that 60-day period.

111.2 Revocation of a Certificate. The *code official* is authorized to revoke a *Certificate* or Letter of Core and Shell Completion issued under Section 110 as to the whole or a portion of a *premises*, as reasonably deemed appropriate by

the *code official*, upon service of notice as specified by Section 111.3, for any of the following conditions:

1. Where the *Office of Administrative Hearings* (OAH) or *Board of Zoning Adjustment* (BZA) has issued an order revoking a *Certificate* or finding that a *Certificate* was issued in error.
2. Where the *owner* or permit holder or the *Registered Design Professional in Responsible Charge* has been cited, under Section 115 or 116 of this code, for one or more violations of the *Construction Codes* which, by the determination of the *code official*, threaten the health and safety of the public in the District of Columbia, and when the *Certificate* holder fails to restore safety or otherwise remedy the situation under the terms and conditions of the *code official's* order and within the time period specified.
3. Where the application or information on which the issuance of the *Certificate* was based contained a significant inaccuracy, a false statement or a material misrepresentation of fact that substantively affected the approval and issuance of the *Certificate*.
4. When the *code official* determines that the *Certificate* has been erroneously issued as the result of administrative or clerical error and notifies the *Certificate* holder of the error within five business days after *Certificate* issuance.
5. When the *code official* determines that the *Certificate* has been erroneously issued as the result of administrative or clerical error and notifies the *Certificate* holder of the error more than five business days after *Certificate* issuance.
6. Where the actual occupancy does not conform with that which was permitted under the *Certificate*, including any conditions, or permitted under the applicable laws and regulations of the District, including, but not limited to situations where the use is being operated in violation of one or more conditions of any Zoning Commission or Board of Zoning Adjustment Order that authorized the establishment of the use or the construction, renovation, or *alteration* of the *building* in which the use is located. Such violations include, but are not limited to, (i) the failure to establish or maintain any public benefit in accordance with a condition set forth in any Zoning Commission order granting a planned unit development on the *premises* in which the use is located, or (ii) the failure to comply with a condition imposed by the *Board of Zoning Adjustment* (BZA) in any special exception or variance order of that Board related to the *premises* in which the use is located.
7. When all of the following conditions are verified:
 - a. The *premises* or portion thereof, for which a *certificate* had been previously issued, is undergoing *alteration* or repair, or an addition thereto is being constructed, under a duly issued permit, and the original use is being continued during the construction period.

- b. The *code official* deems that construction is not progressing at a reasonable pace and the unfinished portion of the project, as shown on the *approved construction documents*, or the missing systems or portions thereof, are such that the *code official* deems that the safety, health or welfare of the public or of the occupants is seriously threatened thereby.
8. Where the *owner* or occupant fails to timely apply for a new Certificate in accordance with Section 110, where such certificate is required, the Certificate previously issued for the *premises* or portion thereof shall be revoked in whole or in part, as applicable.

111.2.1 Effective date of revocation. Revocations of a Certificate shall become final upon occurrence of one of the following conditions:

1. Revocations based on Item 1 of Section 111.2 shall be summary revocations and shall take effect on the effective order of the *OAH* or *BZA*.
2. Revocations based on Item 2 of Section 111.2 shall be summary revocations and shall take effect on the date ordered by the *code official*.
3. Revocations based on Item 3 of Section 111.2 shall be summary revocations that take effect upon timely issuance of a notice by the *code official* to the Certificate holder declaring the Certificate null and void.
4. All revocations based on Section 111.2 other than those subject to Items 1, 2 or 3 of Section 111.2, shall be proposed actions that will take effect upon one of the following conditions:
 - a. Based on violations of the *Construction Codes*, ten *business days* after service of the notice of revocation pursuant to Section 111.3 unless the permit holder requests a hearing to appeal the proposed revocation from the *Office of Administrative Hearings* (OAH) within that ten *business day* period.
 - b. Based on violations of the *Zoning Regulations*, within the 60-day period established in Section 11-Y 302 of the *Zoning Regulations* for appeals to the *Board of Zoning Adjustment* (BZA), after service of the notice of revocation pursuant to Section 111.3 unless the permit holder requests a hearing to appeal the proposed revocation from the *Board of Zoning Adjustment* (BZA) within that 60-day period.

111.3 Notice of revocation of a permit or Certificate. The *code official* or Zoning Administrator shall provide written notice of the revocation to the holder of the permit or Certificate of Occupancy. This notice shall include all of the following:

1. A statement of the grounds for the action taken, citing the provisions of the DC Official Code, the *Construction Codes* or the *Zoning Regulations* which have been violated.
2. The effective date of the proposed revocation.

3. A statement advising the permit holder or Certificate holder of the right to appeal the revocation in accordance with Section 112.2.

Exception: For revocations based on Item 1 of Section 111.1 and Item 1 of Section 111.2, the *Order of the Office of Administrative Hearings* (OAH) or of the *Board of Zoning Adjustment* (BZA), as applicable, ordering the revocation of a permit or Certificate or finding that a permit or Certificate has been issued in error, shall constitute the Notice of Revocation required under this section and no additional notice is required.

111.3.1. Service of notice to revoke a permit or Certificate. The *code official* shall provide service of a notice to revoke a permit to the permit holder or the permit holder's agent in accordance with Section 113.5. The *code official* shall provide service of a notice to revoke a Certificate to the Certificate holder or the Certificate holder's agent in accordance with Section 113.5.

111.4 Appeals of revocations. Appeals of revocations of permits and of Certificates shall be governed by Section 112.

Exception: Revocations based on Item 1 of Section 111.1 and Item 1 of Section 111.2 shall not be appealed to the *Office of Administrative Hearings* (OAH) or the *Board of Zoning Adjustment* (BZA), as applicable, but instead shall be appealed only to the District of Columbia Court of Appeals pursuant to Section 11 of An Act To prescribe administrative procedures for the District of Columbia Government, *approved* October 21, 1968 [82 Stat. 1209; DC Official Code § 2-510 (2016 Repl. & 2018 Supp.)].

SECTION 112 INTERNAL AGENCY REVIEW AND APPEALS OF FINAL DECISIONS OF CODE OFFICIAL AND ZONING ADMINISTRATOR

112.1 Internal agency review process. The purpose of this section is to facilitate internal agency review of a Staff Action (as defined in Section 112.1.2) by the *code official* or *Zoning Administrator* in certain limited situations authorized by Sections 112.1.1 through 112.1.4.

112.1.1 Persons authorized to seek internal agency review. The right to seek internal agency review is available only to an applicant for a permit or Certificate, or the holder of a permit or Certificate, that is adversely affected or aggrieved by a Staff Action as defined in Section 112.1.2, or by *persons* specified in Section 112.1.1.1.

112.1.1.1 Stop Work Orders for illegal construction. Where a person is served with a Stop Work Order for violation of the *Construction Codes* in accordance with Section 114, and such *person* is neither a permit applicant nor a permit holder, such *person* is authorized and required to seek internal agency review of the Stop Work Order by the *code official* in accordance with the provisions of Section 112.1 before initiating an appeal to *OAH* or the *Board of Zoning Adjustment* (BZA) pursuant to Sections 112.2 and 112.3, as applicable.

112.1.2 Staff Action subject to internal agency review.

A Staff Action for purposes of Section 112.1 shall consist of an interpretation of the *Construction Codes* or *Zoning Regulations*, or an action or decision based on such interpretation, that is made or taken by *Department* staff other than the *code official* or the *Zoning Administrator*, and which relates only to any of the following:

1. Application processing.
2. Interpretation or application of pertinent provisions of the *Construction Codes* or the *Zoning Regulations*.
3. Inspections.
4. A Stop Work Order issued pursuant to Section 114.

112.1.3 Requirements to obtain code official review of a Staff Action. To seek *code official* review of a Staff Action pursuant to Section 112.1, the following conditions apply:

1. *Code official* review pursuant to Section 112.1 shall only be available to the *persons* authorized to seek internal agency review as specified in Sections 112.1.1 and 112.1.1.1 (the “aggrieved person”).
2. The request for internal agency review by the *code official* shall be submitted by the aggrieved person on a review form provided by the *Department* and shall state in writing the grounds for the requested review of a Staff Action, with: (i) references to the specific provisions of the *Construction Codes* that are alleged to have been incorrectly interpreted or applied, and (ii) where evidence of alternate methods or means of compliance with the *Construction Codes* is proposed by the aggrieved person, evidence to support the assertion that an equally good or better form of construction can be used in compliance with the *Construction Codes*.
3. Internal agency review authorized by Section 112.1 must be initiated by the aggrieved person no later than ten *business days* after the aggrieved person (as defined in Sections 112.1 and 112.1.1) is notified of or learns of the Staff Action.

112.1.3.1 Time of notification for Section 112.1.3. For purposes of Section 112.1.3, the aggrieved person shall be deemed to have been notified of the Staff Action on the earliest occurrence of any of the following:

1. Posting of a Stop Work Order in accordance with Section 114.
2. Entry of a hold for corrections by the *Department* on the *Department’s* review database.
3. Entry of a failure to pass a required inspection on the *Department’s* review database.
4. Refusal by *Department* staff to accept an application for issuance of a permit or a Certificate.
5. Notification by *Department* staff in writing or by electronic communication to the aggrieved person that all submittal documents required by Sec-

tion 106 pertinent to the permit applied for, or documentation specified in Section 110 to support an application for a Certificate, is absent or deemed insufficient.

6. Notice by *Department* staff, issued in writing or by electronic communication to the aggrieved person, that continued processing of an application for issuance of a permit or Certificate is suspended pending compliance with one or more specified sections of the *Construction Codes*.

112.1.4 Requirements to obtain Zoning Administrator review of a Staff Action. To seek *Zoning Administrator* review of a Staff Action pursuant to Section 112.1, the following conditions apply:

1. Zoning Administrator review pursuant to Section 112.1 shall only be available to the *persons* authorized to seek internal agency review as specified in Sections 112.1.1 and 112.1.1.1 (the “aggrieved person”).
2. The request for internal agency review by the Zoning Administrator shall be submitted by the aggrieved person on a review form provided by the *Department* and shall state in writing the grounds for the requested review of a Staff Action with references to the specific provisions of the *Zoning Regulations*, that are alleged to have been incorrectly interpreted or applied.
3. Internal agency review authorized by Section 112.1 must be initiated by the aggrieved person no later than ten *business days* after the aggrieved person (as defined in Sections 112.1.1 and 112.1.1.1) is notified of or learns of the Staff Action.

112.1.4.1 Time of notification for Section 112.1.4. For purposes of Section 112.1.4, the aggrieved person shall be deemed to have been notified of the Staff Action on the earliest occurrence of any of the following:

1. Posting of a Stop Work Order in accordance with Section 114.
2. Entry of a hold for corrections by the *Department* in the *Department’s* database.
3. Entry of a failure to pass a requested inspection in the *Department’s* database.
4. Refusal by staff of the Office of the *Zoning Administrator* to process an application for issuance of a permit or a Certificate.
5. Notification by staff of the Office of the *Zoning Administrator*, issued in writing or by electronic communication to the aggrieved person, that all submittal documents required by Section 106 pertinent to the permit applied for or documentation specified in Section 110 to support an application for a Certificate, relative to consideration for compliance with the *Zoning Regulations*, in either case, is absent or deemed insufficient.

6. Notice by staff of the Office of the *Zoning Administrator*, issued in writing or by electronic communication to the aggrieved person, that continued processing of an application for issuance of a permit or Certificate is suspended pending compliance with one or more specific sections of the *Zoning Regulations*.

112.1.5 Code official action on request for agency internal review. Upon receipt of a request for review that complies with Section 112.1.2, the *code official* shall affirm, modify, or reverse the Staff Action within 15 *business days* of receipt of such request. If the *code official* affirms the Staff Action, or does not act upon the review request within the 15 *business day* period, the Staff Action shall be deemed affirmed. The decision of the *code official* on requests for an internal agency review of a Staff Action authorized by Section 121.1, shall be a final decision of the *Department* on the specific issue raised in the review request which the aggrieved person (as defined in Sections 112.1.1 and 112.1.1.1) may appeal to *OAH* in accordance with Section 112.2.

112.1.6 Zoning Administrator action on request for agency internal review. The *Zoning Administrator* shall affirm, modify, or reverse the Staff Action within 15 *business days* of receipt of a review form that complies with Section 112.1.3. If the *Zoning Administrator* affirms the Staff Action or does not act upon the review request within the 15 *business day* period, the Staff Action shall be deemed affirmed. The decision of the *Zoning Administrator* on requests for an internal agency review of a Staff Action allegedly in violation of the *Zoning Regulations*, including the passive affirmation of a challenged Staff Action, shall be the final decision of the *Zoning Administrator*, which the aggrieved person (as defined in Sections 112.1.1 and 112.1.1.1) may appeal to the *Board of Zoning Adjustment* in accordance with Section 112.2.2.

112.1.7 Effect of filing of request review of Staff Action. Notwithstanding the foregoing, the submission of a request for internal agency review of a Staff Action by an aggrieved person (as defined in Sections 112.1.1 and 121.1.1.1) shall not stay the time period established in the *Zoning Regulations* within which to appeal the Staff Action decision to the *Board of Zoning Adjustment*.

112.2 Appeal of a final decision of the code official based on alleged violations of the Construction Codes. The applicant for, or holder of, a permit or Certificate, or any *person* directly affected or aggrieved in a materially adverse manner by a final decision or order of the *code official*, including but not limited to issuance or revocation of a permit or Certificate, is authorized to appeal the final decision or order, or portion thereof, that is based upon the *Construction Codes* by filing an appeal with the *Office of the Administrative Hearings* (*OAH*).

The appeal shall be filed within 10 *business days* after the date the appellant had notice or knowledge of the decision, or should have had notice or knowledge of the decision, whichever is earlier, subject to the reconsideration procedure for permits involving adjoining property issues set forth in Section 112.7.

This 10-*business day* appeal period shall not be extended, tolled, or restarted by a request for an internal agency review under Section 112.1, but the appeal period shall be extended where reconsideration is timely sought in accordance with Section 112.7 as to the limited issue of whether the proposed work plan will provide adequate technical protection to the adjoining *premises*. The appeal shall specify the specific provisions of the *Construction Codes*, or the rules legally adopted thereunder, that the appeal alleges the *code official* incorrectly interpreted or applied and shall provide evidence to support an allegation, if part of the appeal, that an equally good or better form of construction can be used.

In reviewing an appeal based in whole or in part on a technical determination or interpretation by the *code official*, *OAH* shall have no authority to waive requirements of the *Construction Codes* and shall not overrule the *code official's* technical determination or interpretation unless determined by *OAH* to be arbitrary or capricious.

Exceptions:

1. *OAH* review of a notice or order to close or vacate residential *premises* issued pursuant to Section 115 shall be based solely on the issue of whether the *code official's* determination that the *premises* are unsafe or unfit for occupancy requiring a *building* closure under the provisions of Section 115 was arbitrary and capricious.
2. *OAH* review of a notice or order to close or vacate residential *premises* issued pursuant to Section 116 shall be based solely on the issue of whether the *code official's building* closure decision was arbitrary and capricious.
3. Only the *person* that is a party identified in either Section 112.1.1 or Section 112.1.1.1 is authorized to appeal a final decision of the *code official* as a result of the internal agency review process authorized by Section 112.1.

112.2.1. Appeal by permit holder of summary revocation under Section 111.1 (Item 2). When a summary revocation of a permit is ordered under Item 2 of Section 111.1, the permit holder is authorized to request an expedited hearing from *OAH* within 72 hours (excluding Saturdays, Sundays and legal holidays) after service of notice of the revocation pursuant to Section 111.3.1, to review the reasonableness of the revocation order. At this hearing, the *code official* shall have the burden of establishing a *prima facie* case of immediate or serious and continuing endangerment. The *OAH* shall not stay the *code official's* decision to revoke a permit under Item 2 of Section 111.1 pending the final resolution of the hearing.

112.2.2 Appeal by Certificate holder of summary revocation under Section 111.2 (Item 2). When a summary revocation of a permit is ordered under Item 2 of Section 111.2, the permit holder is authorized to request an expedited hearing from *OAH* within 72 hours (excluding Saturdays, Sundays and legal holidays) after service of notice of the revocation pursuant to Section 111.3.1, to review the reasonableness of the revocation order. At this hearing, the *code official* shall have the burden of establishing a *prima*

facie case of immediate or serious and continuing endangerment. The *OAH* shall not stay the *code official's* decision to revoke a permit under Item 2 of Section 111.1 pending the final resolution of the hearing.

112.2.3 Request for expedited hearing of building closure pursuant to Section 115 by tenant or occupant of rental unit. Where a notice or order to close or vacate a building with *rental units* is issued pursuant to Section 115, a tenant or occupant of a rental unit affected by such notice or order has a right to request an expedited hearing by *OAH* prior to the closure subject to the following requirements:

1. The *tenant* or occupant shall file the request for an expedited hearing with *OAH* no later than the date specified in the notice or order for *tenants* or occupants to vacate the *premises*.
2. *OAH* review shall be based solely on the issue of whether the *premises* are unsafe or unfit for occupancy requiring a *building* closure under the provisions of Section 115.
3. Enforcement of the closure notice or order shall be stayed until *OAH* issues a written decision.
4. *OAH* shall hold a hearing within 72 hours of receipt of a timely request, and shall issue a decision within 72 hours after the hearing. For purposes of computing these 72-hour periods, Saturdays, Sundays and legal holidays shall be excluded.

112.2.3.1 Additional provisions applicable to buildings with residential units. Nothing herein shall be construed to authorize an expedited hearing for any orders or notices issued, or actions taken, pursuant to Section 116. Appeal of a notice or order under Section 115 to close or vacate a *building* with *rental units*, or a request for an expedited hearing pursuant to Section 112.2.1.3, shall not preclude the *code official* from issuing a notice or order pursuant to Section 116 for the same *premises*, or any portion thereof, while such appeal or hearing is pending.

112.3 Appeal of a final decision of the Zoning Administrator based on alleged violations of the Zoning Regulations. The applicant for, or holder of, a permit or Certificate, or any *person* directly affected or aggrieved in a materially adverse manner by a final decision or order of the *Zoning Administrator*, including a revocation of a permit or Certificate, may appeal those aspects of the final decision or order that are based upon the *Zoning Regulations* to the *Board of Zoning Adjustment (BZA)* of the District of Columbia, pursuant to DC Official Code § 6-641.07 (2018 Repl.). The appeal shall be filed within a 60-day period after the date the appellant had notice or knowledge of the decision, or should have had notice or knowledge of the decision, whichever is earlier, as established by the *Zoning Regulations*. The appeal shall specify the specific provisions of the *Zoning Regulations*, or the rules legally adopted thereunder, that the appeal alleges the *Zoning Administrator* incorrectly interpreted or applied.

Exception: Only the aggrieved person (as defined in Sections 112.1.1 and 112.1.1.1) is authorized to appeal a final

decision of the *Zoning Administrator* as a result of the internal agency review process authorized by Section 112.1.

112.4 Appeal of orders of OAH or BZA. No appeal may be taken to *OAH* or to the *BZA* when a ground for revocation of a permit or Certificate is an order of *OAH* or the *BZA* finding that the permit or Certificate was issued in error. The revocation in such cases may be appealed to the District of Columbia Court of Appeals pursuant to DC Official Code § 2-510.

112.5 Enforcement of OAH or BZA orders. The *code official* or the *Zoning Administrator*, as applicable, shall take immediate action in accordance with the Order of the *OAH* or the *BZA*, as applicable, in any appeal.

112.6 Stay of enforcement. Appeals of notices or orders issued by the *code official* or *Zoning Administrator* shall stay the enforcement of the notice or order until the appeal is heard by *OAH* or *BZA*.

Exceptions:

1. Closure or imminent danger notices or orders issued pursuant to Section 116, and related orders to vacate *premises*.
2. Closure notices or orders issued pursuant to Section 115, and related orders to vacate *premises*, except where the *tenant* or occupant has requested an expedited *OAH* hearing in accordance with Section 112.2.3.
3. Stop Work Orders.
4. Revocation of one or more Certificates based upon one or more violations of the *Zoning Regulations*.
5. Summary revocation of permits and/or Certificates in accordance with Items 1, 2 and 3 of Sections 111.1.1 and 111.2.1.

112.7 Limited right of reconsideration of Code Official action by owner of adjoining premises. Where notification of the *owner* of adjoining *premises* is required by Section 106.2.18.3, the *owner* entitled to such notification by a permit applicant shall have 10 *business days* from the date that the permit is issued to seek reconsideration by the *code official*, based solely on the grounds that: (1) the permit authorizes one or more construction activities identified in Section 106.2.18.3; and (2) the work authorized by the permit will not protect the adjoining *premises* of the objecting owner from structural damage. The objection shall include (1) technical support for the objecting *owner's* conclusions that the work authorized by the permit will not protect the adjoining *premises* of the objecting *owner* from structural damage; and (2) any proposed changes to the work plan that the claimant asserts are necessary to protect the claimant's *premises* from structural damage. A copy of the request for reconsideration shall be served on the permit holder in accordance with any of the methods specified in Section 113.5.5. The sufficiency of notification under Section 106.2.18.3.1, or the *code official's* determination of substantial compliance pursuant to Section 106.2.18.3.1.4, shall not be subject to challenge upon reconsideration.

112.7.1 Review by the Code Official. Within 15 *business days* of receipt of a written reconsideration request that complies with Section 112.7, the *code official* shall determine whether the specific measures requested by the *owner* of the adjoining *premises* are supported by technical documentation. If the *code official* denies reconsideration, or does not act upon the reconsideration within the 15 *business day* period, the permit issuance shall be deemed affirmed and the claimant is authorized to appeal the matter directly to *OAH* in accordance with Sections 112.2 and 112.3. If the *code official* finds the technical documentation submitted by the claimant to be persuasive, the *code official* is authorized to require the permit holder to revise the proposed work plan, to amend the permit, to revoke the permit, or to take such other actions as the *code official* deems necessary to protect the adjoining *premises*.

SECTION 113 VIOLATIONS, REMEDIES, PENALTIES AND OTHER ENFORCEMENT ACTIONS

113.1 Unlawful acts. It shall be unlawful for any *person* to erect, construct, alter, extend, repair, *raze*, demolish, use, or occupy any *premises*, or portion thereof, including any equipment thereon, regulated by the *Construction Codes* or *Zoning Regulations*, or cause same to be done, in conflict with or in violation of any of the following:

1. Any of the provisions of the *Construction Codes* or *Zoning Regulation*.
2. A notice or order of the *code official* issued under the authority of the *Construction Codes* or the *Zoning Regulations*.
3. A permit or certificate, including the *approved construction documents* and *approved* amendments thereto, issued under the provisions of the *Construction Codes* or the *Zoning Regulations*.

Any *person* engaging in or causing unlawful acts as defined in Sections 113.1 and 113.1.1 shall be subject to penalties as prescribed by law, including but not limited to those set forth in Section 113.2.

113.1.1 Work without a permit. Work started or occurring without a permit where a permit is determined to be required under Section 105 shall be a violation of the *Construction Codes*.

113.1.2 Continuation of unlawful use. The continuation of occupancy or use of a *premises*, or portion thereof, contrary to the provisions of the *Construction Codes* or to the provisions of the *Zoning Regulations*, shall be a violation or infraction under the *Construction Codes*. The *code official*, as defined in Section 103.1, is authorized to issue a notice of violation and order requiring discontinuance of the use or occupancy, and the *owner* or other violator shall be subject to the penalties or fines prescribed in Section 113.

113.2 Enforcement methods. The *code official* is authorized to use any of the methods set forth in the *Construction Codes* or in other District of Columbia laws and regulations, singly or in combination, to enforce compliance with the *Construc-*

tion Codes, the *Zoning Regulations*, other laws or regulations enforced by the *Department*, and notices or orders of the *code official* issued pursuant thereto, including, but not limited to, the following:

1. Stop Work Orders (Section 114).
2. Revocations of Permits and Certificates of Occupancy (Section 111).
3. Notices of Unsafe or Emergency Conditions and *Building Closure Orders* (Sections 115 and 116).
4. Notices of Violations or Orders directing the discontinuance of an unlawful action or condition and/or the abatement of the violation.
5. Penalties as set forth in DC Official Code § 6-1406 (2018 Repl.).
6. Injunctive relief as set forth in DC Official Code § 6-1407 (2018 Repl.).
7. Criminal prosecution pursuant to DC Official Code § 6-1406 (2018 Repl.).
8. Civil fines, penalties, and fees in addition to any other available remedies, for any infraction of the provisions of the *Construction Codes* or *Zoning Regulations*, or any orders, rules, or regulations issued under the authority of the *Construction Codes*, pursuant to the Civil Infractions Act, (DC Official Code §§ 2-1801.01 *et seq.* (2016 Repl. & 2018 Supp.)) as amended; DC Official Code § 6-1406 (2018 Repl.) as amended; and Title 16 DCMR, Chapters 31–34.
9. Actions pursuant to An Act To provide for the abatement of nuisances in the District of Columbia by the Commissioners of said District, and for other purposes, *approved* April 14, 1906 [34 Stat. 114; DC Official Code §§ 42-3131.01 *et seq.* (2012 Repl. & 2018 Supp.)], and the Due Process Demolition Act of 2002, effective April 19, 2002 [DC Law 14-114; DC Official Code §§ 42-3171.01 *et seq.* (2012 Repl. & 2018 Supp.)].
10. Suspension, restriction or revocation of licenses issued by the *Department* to the general contractor, contractor, construction manager, or referral to the Board having jurisdiction over a tradesperson, architect or engineer for suspension, restriction or revocation of a license or other appropriate disciplinary action.
11. Disconnection of service utilities (Section 119.3).

113.3 Code Official authority. The *code official* is authorized to issue all necessary notices or orders to ensure compliance with: (1) the *Construction Codes*, the *Zoning Regulations* and other laws or rules enforced by the *Department*; (2) notices or orders of the *code official* issued pursuant to the *Construction Codes*, the *Zoning Regulations* and other laws or rules enforced by the *Department*; and (3) *permits* or certificates issued under the provisions of the *Construction Codes* or *Zoning Regulations*, including the *approved construction documents* and any *approved* amendments thereto.

113.3.1 Prosecution or adjudication of violation. The *code official* is authorized to institute, or to request the

Office of the Attorney General for the District of Columbia to institute, as the case may be, the appropriate proceedings at law or in equity to prosecute, restrain, correct, or abate a violation, or to require the removal of a *building* or other *structure*, or the termination of the unlawful use or occupancy of a *premises* in violation of the provisions of the *Construction Codes* or the *Zoning Regulations* or of an order or direction made under the *Construction Codes* or the *Zoning Regulations*. The imposition of any remedies, penalties or enforcement actions authorized in the *Construction Codes* shall not preclude the Office of the Attorney General for the District of Columbia from instituting appropriate action to prevent unlawful construction or to restrain, correct, or abate a violation, or to prevent illegal occupancy of a *premises*, or to stop an illegal act, conduct, business, or use of a *premises*.

113.3.2 Continuing violations. Each day a violation continues shall, for purposes of criminal prosecutions [Section 113.2(7)] and civil fines [Section 113.2(8)], be considered a separate offense.

113.3.3 Abatement of violation by department. The imposition of any remedies, penalties or enforcement actions authorized by Section 113, other provisions of the *Construction Code*, or other laws and regulations of the District of Columbia, shall not preclude or prevent the *Department* from undertaking abatement or corrective actions as authorized by the *Construction Codes* or by other statutes and regulations, including, but not limited to, the Nuisance Abatement Act, DC Official Code §§ 42-3131.01 *et seq.* (2012 Repl. & 2018 Supp.). The *code official* is authorized to assess the costs of any abatement or corrective actions undertaken by the *Department*, and all expenses thereto as a tax against the property on which the violating condition existed, or from which such condition arose as the case may be, and such tax shall be carried on the regular tax rolls of the District, and collected in the same manner as general taxes in the District are collected.

113.3.4 Collection of Unpaid Civil Fines. See DC Official Code § 2-1802.03.

113.3.5 Notice of Violation Not a Prerequisite. Issuance of a notice of violation or order directing the discontinuance of an unlawful action or condition and/or the abatement or correction of a violation, prior to taking other enforcement action, is at the discretion of the *code official*. Failure to issue such notice of violation or order shall not be a bar or a prerequisite to any criminal prosecution, administrative proceeding, civil action, corrective action or civil infraction proceeding based upon a violation of the *Construction Codes* or the *Zoning Regulations*.

113.4 Requirements for form and content of notices or orders.

113.4.1 Stop Work Orders. See Section 114.2.

113.4.2 Revocations of permits and Certificates. See Section 111.3.

113.4.3. Notice of unsafe condition. See Section 115.3 with the exception of remedial orders pursuant to Section 115.4.

113.4.4 Notice of emergency condition; order to vacate premises. See Section 116.1.1 and 116.1.2

113.4.5 Notices of Infraction. See DC Official Code § 2-1802.01(b).

113.4.6 Other notices and orders. Notices or orders issued by the *code official*, except for those covered by 113.4.1 through 113.4.5, shall be in accordance with all of the following:

1. Be in writing.
2. Include a description of the *premises* subject to the notice or order sufficient for identification.
3. State the reason for the notice or order.
4. Identify the code section(s) violated, and why the notice or order is being issued.
5. Include, if the notice or order affords an opportunity to abate a violation, a reasonable period of time to make the repairs and improvements required to bring the *premises* or equipment thereon into compliance with the provisions of the *Construction Codes*.
6. Include, if applicable, a specific time by which *premises* shall be closed, barricaded and/or vacated, or equipment placed out of service.
7. Inform the *owner* of the right to appeal to *OAH* or *BZA*, as applicable, pursuant to Section 112.
8. Include a statement of the District of Columbia's right: to abate a specified violation without the *owner's* consent if the *owner* fails to comply with a notice or order directing the abatement of the violation or to file a timely appeal; to assess the costs of such abatement against the *owner*; and to place a tax lien on the property in accordance with Section 113.3.4 for the costs of such abatement.

113.5. Service of notices and orders.

113.5.1 Stop Work Orders. See Sections 114.3 and 114.4.

113.5.2. Notice of unsafe condition. See Section 115.3 with the exception of remedial orders pursuant to Section 115.4.

113.5.3 Notice of emergency condition; order to vacate premises. See Sections 116.1.1 and 116.1.2.

113.5.4. Notices of infraction. See DC Official Code § 2-1802.05.

113.5.5 Other notices and orders. A notice of violation or any other authorized notice or order not covered by Sections 113.5.1 through 113.5.4, shall be served on the *owner*, operator, occupant, permit or certificate holder, or other person responsible for the unlawful act or condition (the "respondent") by any one of the following methods:

1. Personal service on the respondent or respondent's agent.
2. Delivery of the notice or order by e-mail, with confirmation of delivery, to the e-mail address provided to the *Department* by the respondent or respondent's

agent, as required by Section 105.3.2, Items 8 and 9. If the respondent has failed to comply with Section 105.3.4, service is deemed effective if made to the last known e-mail address filed by the respondent or respondent's agent with the *Department*.

3. Delivery of the notice or order by hand to the last known home or business address of the respondent or respondent's agent as identified by the permit or certificate application, tax records, corporate registration records, or business license records, and leaving it with a person over the age of 16 years old present at the time at the home or business address.
4. Mailing the notice or order, via USPS first class mail postage prepaid or express mail, or by private delivery services (*i.e.*, DHL Express, FedEx, UPS), at least five days prior to the date of the proposed action, to the last known home or business address of the respondent or respondent's agent as identified by the permit or certificate application, tax records, corporate registration records, or business license records; or
5. If the notice or order is returned as undeliverable by the Post Office authorities, or if no address is known or can be ascertained by reasonable diligence, by posting a copy of the notice or order in a conspicuous place in or about the *premises* affected by such notice or order.
6. Posting of a notice on property or on a *building* or portion of a *building* at, near or adjacent to the area identified as the subject of the violation. Pictures of the posting shall be maintained by the *department* and associated with the notice of violation.

113.5.5.1 Respondent's agent. For the purposes of this section, respondent's agent shall include a general agent, employee, registered agent, or attorney of the respondent.

113.6 Additional procedural requirements applicable to premises with rental units. Where a notice or order is issued to the *owner* of *premises* with respect to a *rental unit* occupied by a *tenant*, the *code official* shall provide such *tenant* with a copy of the notice or order. This requirement will be satisfied by mailing a copy to the *tenant* by first-class mail, leaving a copy at the *tenant's* residence with a responsible individual at least 16 years of age present there, or any other reasonable method in the *code official's* discretion.

113.6.1. Premises with multiple rental units. In *premises* with more than one *rental unit*, any instance where a notice or order affects the *rental unit* and/or common space of more than one *tenant*, the *code official* shall post a copy of any notice or order issued to the *owner* pursuant to Section 113 for a reasonable time in one or more locations on the *premises* where the violation exists. The locations for posting the notification shall be reasonably selected to give notice to all *tenants* affected. Any *tenant* directly affected by the violation(s) shall, upon request to the *code official*, be sent a copy of the posted notification.

113.6.2. Exclusivity of tenant notice provisions. The *code official* shall not be subject to any other *tenant* notification provisions, except as expressly set forth in Section 113.6.

113.6.3 Notices or orders requiring closure of premises with rental units. Where the *code official* (a) posts a notice of unsafe condition on a *building* with *rental units* that prohibits access to or occupancy of the *premises* or issues an order to close and barricade a *building* with *rental units* pursuant to Section 115, or (b) posts a notice of emergency condition pursuant to Section 116 on a *building* with *rental units* requiring tenants and occupants to vacate the *premises*, the following additional requirements shall apply:

1. The notice or order shall specify a date and time by which *tenants* or occupants of the *rental units* are required to vacate the *premises*.
2. The notice or order shall include a statement informing *tenants* or occupants of the *rental units* of the right to appeal pursuant to Section 112.2, including, where applicable, the right to an expedited hearing pursuant to Section 112.2.3.
3. The *code official* shall provide a copy of the notice or order to each *tenant* of the *rental units* affected by the notice or order by leaving a copy at each *dwelling unit* or any other reasonable method in the *code official's* discretion.
4. The notice or order shall provide contact information for the Office of the Tenant Advocate.

113.7 Transfer of ownership. It shall be unlawful for the *owner* of any *premises* or portion thereof, upon whom a notice of violation or order directing the discontinuance of an unlawful act or condition and/or the abatement or correction of a violation has been served, to sell, transfer, or otherwise dispose of such *premises*, or of a controlling interest in the *owner*, to another *person* until the conditions of the notice or order have been abated, or such *owner* furnishes the buyer or transferee with a true copy of any notice or order issued by the *code official* and furnishes the *code official* with a signed and notarized statement from the buyer or transferee, acknowledging the receipt of such notice or order and fully accepting responsibility, without condition, for making the corrections or repairs required by such notice or order. Notwithstanding the foregoing, a sale, transfer or other disposition shall not relieve the *owner* upon whom the notice or order is served from liability for the unlawful act.

SECTION 114 STOP WORK ORDERS

114.1 Authority. Whenever the *code official* finds that any work on any *premises* is being performed in violation of the provisions of the *Construction Codes* or the *Zoning Regulations*, or in an unsafe or dangerous manner, the *code official* is authorized to issue a Stop Work Order.

114.1.1 Partial Stop Work Order. The *code official* is authorized to issue a partial Stop Work Order prohibiting certain types of work on the *premises* or all work in a par-

ticular area of the *premises*. A partial Stop Work Order shall specify in writing what activities and areas are within the scope of the partial Stop Work Order. If the *code official* provides a separate written authorization modifying the scope of work allowed under a partial Stop Work Order, the *owner*, *owner's* agent or person doing work on the *premises* posted with the partial Stop Work Order shall retain a copy of the written authorization. Unless otherwise expressly stated, the term "Stop Work Order" shall, for purposes of the *Construction Codes*, include a partial Stop Work Order.

114.2 Form and content of Stop Work Order. The Stop Work Order shall be in writing, in a form prescribed by the *code official*. The Stop Work Order shall contain the following information:

1. The reason for the order, and the conditions under which the cited work will be permitted to resume.
2. The address of the *premises*.
3. The specific activities and areas of the *premises* covered by the order if a partial Stop Work Order is issued pursuant to Section 114.1.1.
4. The specific section or sections of the *Construction Codes* and/or the *Zoning Regulations* violated.
5. Whether access to the *premises* or a portion thereof is prohibited during the pendency of the Stop Work Order.
6. A description of the right to appeal the Stop Work Order, and information on how and where to file an appeal, and the deadline to file such appeal.

No Stop Work Order shall be issued nor considered valid unless it contains all of the information specified in this section, and the signature of the issuing official.

114.3 Service of a Stop Work Order. The *code official* shall effect service of a Stop Work Order by one of the following methods:

1. Personal service on the owner of the *premises* involved or on the owner's agent, or to the person doing the work at the *premises*.
2. Posting the Stop Work Order on the *premises* in accordance with Section 114.4.

114.4 Posting of Stop Work Order. Regardless of the manner of service of the Stop Work Order, the *code official* shall post the Stop Work Order in a conspicuous location, in or about the *premises* subject to the Stop Work Order.

114.5 Effect of Stop Work Order. Upon service of a Stop Work Order pursuant to Section 114.3, all construction activity on the *premises*, or the work specified in a partial Stop Work Order issued pursuant to Section 114.1.1, shall immediately cease until the *Department* issues an official written authorization lifting the Stop Work Order, or as otherwise provided for by the *code official*.

114.5.1 Access to premises covered by a Stop Work Order. Access to *premises* or portion thereof covered by a Stop Work Order shall be at the discretion of the *code official*.

114.6 Removal or obstruction of a posted Stop Work Order. Unauthorized removal or obstruction of a posted Stop Work Order is a violation of the *Construction Codes*, and is subject to the penalties provided in Section 113 and DC Official Code § 6-1406 (2018 Repl.), and the injunctive relief set out in DC Official Code § 6-1407 (2018 Repl.). The *owner* of the *premises* posted with a Stop Work Order, or the *owner's agent*, shall promptly notify the *Department* if the posted Stop Work Order has been removed, damaged or obstructed so that the Stop Work Order can be reposted.

114.6.1 Prior written authorization required to remove a posted Stop Work Order. A posted Stop Work Order shall only be removed pursuant to an official written authorization from the *Department*. If a posted Stop Work Order is removed without the *Department's* official written authorization, the *owner* or the *owner's agent* shall notify the *Department* in accordance with Section 114.6, and no work shall be resumed until the *Department* reposts the Stop Work Order at the *premises* or issues an official written authorization lifting the Stop Work Order, or as otherwise provided by the *code official*.

114.7 Public notice of Stop Work Order. The *code official* is authorized to make public, by publishing in a newspaper of general distribution, in the *District of Columbia Register*, or at the DCRA website, a list of the addresses where Stop Work Orders have been posted.

114.8 Failure to comply with Stop Work Orders. Any *person* who fails to comply with the terms and conditions of a Stop Work Order, or with the applicable requirements of Section 114, including, but not limited to, the unauthorized removal of a Stop Work Order, shall be in violation of the provisions of the *Construction Codes*, and shall be subject to civil and criminal penalties as set forth in Section 113.

114.8.1 Additional sanctions affecting licensees. Failure to comply with a Stop Work Order shall constitute grounds for suspension, restriction or revocation of any license issued by the *Department* to the noncompliant *registered design professional in responsible charge*, Special Inspector, general contractor, construction manager, or home improvement contractor. Failure to comply with a Stop Work Order by a DC-licensed tradesperson, including but not limited to the following, shall be grounds for referral of the licensee to the Board of Industrial Trades for disciplinary action, including license suspension or revocation:

1. A licensed master electrician.
2. A licensed master electrician limited (low voltage).
3. A licensed journeyman electrician.
4. A registered apprentice electrician.
5. A licensed master mechanic.
6. A licensed master mechanic limited.
7. A licensed journeyman refrigeration and air-conditioning mechanic.
8. A registered apprentice refrigeration and air-conditioning mechanic.

9. A licensed master plumber/gasfitter.
10. A licensed master gasfitter.
11. A licensed journeyman plumber.
12. A licensed journeyman gasfitter.
13. A registered apprentice plumber.
14. A registered apprentice gasfitter.
15. A licensed elevator contractor, or an employee of a licensed elevator contractor.
16. A licensed elevator mechanic.
17. A registered apprentice elevator mechanic.
18. A licensed steam engineer, or another licensed operating engineer.
19. Any *registered design professional in responsible charge* for any portion of the construction work being performed.

114.9 Appeal of Stop Work Order. Appeals of Stop Work Orders shall be in accordance with Section 112.

114.10 Lifting of Stop Work Order. The *code official* shall lift the Stop Work Order when he or she deems that the violations leading to imposition of the Stop Work Order have been corrected or abated to the satisfaction of the *code official*.

SECTION 115 UNSAFE CONDITIONS

115.1 Unsafe conditions. All *premises* or equipment thereon that are or hereafter become abandoned, deteriorated, unsafe, unsanitary, or deficient because of inadequate means of egress facilities, inadequate light and ventilation; or which constitute a fire hazard, or are otherwise dangerous to human life or the public welfare; or that involve illegal or improper use or occupancy or inadequate maintenance, shall be deemed an unsafe condition. Unsafe conditions shall be removed or made safe and secure, as the *code official* deems necessary, pursuant to this section or pursuant to other laws, including, but not limited to, DC Official Code §§ 42-3131.01 *et seq.* (2012 Repl. & 2018 Supp.), DC Official Code §§ 42-3171.01 *et seq.* (2012 Repl. & 2018 Supp.), or DC Official Code §§ 6-801 *et seq.* (2018 Repl.). In addition, unsafe conditions shall include those referenced in Section 108 of the *Property Maintenance Code*. A vacant *premises*, unguarded or open at door or window, shall be deemed a fire hazard and unsafe within the meaning of the *Construction Codes*.

115.2 Examination and record of unsafe premises. The *code official* shall examine every *premises* reported as dangerous, unsafe structurally, or constituting a fire hazard, and shall maintain a record of those *premises* where the *code official* finds an unsafe condition.

115.3 Posting of notice of unsafe condition. Where the *code official* finds an unsafe condition, as defined in Section 115.1, the *code official* shall post a notice of unsafe condition on the *premises* where the unsafe condition exists. The *code official* shall have discretion to post the notice of unsafe condition in

the location or locations that the *code official* deems necessary to warn persons that access to, or use or occupancy of, the *premises* is restricted.

115.3.1 Access to posted premises. The notice of unsafe condition posted in accordance with Section 115.3 shall specify whether entry, use and/or occupancy of the posted *premises*, or a portion thereof, is prohibited by the *code official*. Entry, use and/or occupancy of the posted *premises* shall be at the discretion of the *code official*, subject as applicable to the requirements for closure of *buildings* with *rental units* set forth in Sections 113.2.5 and 115.8.

115.3.2 Compliance with posted notice. Entry, use and/or occupancy of a *premises* or portion thereof in violation of the terms of a posted notice of unsafe condition shall be unlawful.

115.3.3 Unauthorized removal or obstruction of posted notice. Unauthorized removal or obstruction of a posted notice of unsafe condition is a violation of the *Construction Codes*, and is subject to the penalties provided in Section 113 and DC Official Code § 6-1406 (2018 Repl.) and the injunctive relief set out in DC Official Code § 6-1407 (2018 Repl.). The *owner* of the *premises* posted with a notice of unsafe condition, or the owner's agent, shall promptly notify the *Department* if the posted notice has been removed, damaged or obstructed so the notice can be reposted.

115.4 Remedial notices or orders relating to unsafe condition. In addition to posting of a notice in accordance with Section 115.3, where the *code official* finds an unsafe condition, the *code official* is authorized to issue a notice or order to require the *owner* of the *premises* to make the *premises* safe and secure or to remove the unsafe condition as the *code official* deems necessary. The notified *person* shall employ sufficient means to comply with the notice as expeditiously as can be done.

115.4.1 Content and service of remedial notices or orders. The remedial notices or orders specified in Section 115.4 shall comply with the procedures set forth in Sections 113.4.6, 113.5.5 and 113.6.

115.5 Disregard of remedial notice or order. Upon the refusal or neglect of the *person* served with a remedial notice or order pursuant to Section 115.4 to comply with the requirements of the notice or order to abate or remove the unsafe condition, the *code official* is authorized to pursue any penalties or remedies authorized by law or regulation, including, but not limited to, abatement of the unsafe condition by the *code official* or referral to the Office of the Attorney General for appropriate legal action to compel compliance.

115.5.1 Abatement by code official. Where the *person* notified of an unsafe condition pursuant to Section 115.4 fails to abate or remove such unsafe condition, the *code official* is authorized to cause such condition to be corrected and assess the costs of any corrective action, and all expenses incident thereto, as a tax against the property on which the violating condition existed, and such tax shall be carried on the regular tax rolls of the District, and collected in the same manner as general taxes in the District

are collected. Costs shall include, but not be limited to, all expenses incurred for or necessitated by any corrective action; costs of inspectors, testing agencies or experts retained; costs of testing or surveying; costs of mailings, postings and recordings; and costs of attorney's fees expended for recovering the costs of the corrective action or to obtain or enforce a related order.

115.6 Remedies not exclusive. Nothing herein shall be deemed to preclude or negate any other penalties or remedies set forth in Section 113, or to preclude conversion of a special assessment lien to an administrative judgment, enforceable in the same manner as any other civil judgment under District of Columbia law, as authorized by DC Official Code § 42-3131.01.

115.7 Other laws. The provisions of this Section 115 shall not be deemed to nullify any other provisions of local law governing *razing*, *demolition* or repair of unsafe *structures*, including, but not limited to, the provisions of DC Official Code §§ 6-801 *et seq.* (2018 Repl.) as amended, DC Official Code §§ 42-3131.01 *et seq.* (2012 Repl. & 2018 Supp.) as amended, or DC Official Code §§ 42-3171.01 *et seq.* (2012 Repl. & 2018 Supp.) as amended.

115.8 Special provisions applicable to rental units.

115.8.1 Copies of notices and orders. The *code official* shall provide *tenants* of *rental units* with copies of remedial notices and orders issued to the *owner* of the *rental unit* pursuant to Section 115.4 in accordance with Section 113.2.1.3. The *code official* shall not be required to provide *tenants* of *rental units* with copies of any other notices, orders or communications except as expressly required by set forth in Section 113.2.1.3.

115.8.2 Closures of buildings with rental units. The *code official* is authorized to order *tenants* or occupants of *rental units* to vacate the *premises* within a time sufficient to allow the owner to comply with an order to close and barricade the *premises*. The notice or order shall include the time by which the *premises* must be vacated, provided that *tenants* and occupants shall be given at least five calendar days to vacate, unless the *code official* determines that the *tenants* and occupants must leave the *premises* immediately for their personal safety.

If any *tenant* or occupant fails to vacate the *premises* within the time period set forth in the notice or order, subject to the appeal provisions of Section 112.2.3, the *code official* is authorized to order the removal of the *tenants* or occupants.

115.8.3 Other rental housing provisions. The removal of *tenants* from *rental units*, or the service of an order to vacate pursuant to Section 115, shall not be considered an eviction or notice to vacate under DC Official Code § 42-3505.01 (2012 Repl. & 2018 Supp.). Notwithstanding the foregoing, nothing herein shall be construed to nullify or abrogate any other rights to which a tenant is entitled under District laws or regulations, including relocation assistance, the right to reoccupy the rental unit following rehabilitation, or the right to pursue rights and remedies under DC Official Code, Title 42, Chapter 34.

SECTION 116 EMERGENCY CONDITIONS

116.1 Emergency condition. When an emergency condition exists, the *code official* is hereby authorized to take such actions as the *code official* deems necessary to meet such emergency in accordance with this section. An emergency condition shall exist when, in the opinion of the *code official*, there is imminent danger, including, but not limited to any of the following:

1. An unsafe condition, including, but not limited to collapse or potential imminent collapse of a *building*, other *structure*, *site*, or *street*.
2. An unsanitary condition or the operation of defective or dangerous equipment which immediately endangers the health or safety of occupants of a *premises* or those in the proximity of a *premises*.
3. The presence of *flammable materials* or *explosives*, *flammable fumes* or *vapors*, *toxic fumes*, gases, or substances or other hazardous or toxic conditions.

116.1.1 Order to vacate premises. When in the opinion of the *code official* an emergency condition as defined in Section 116.1 exists, the *code official* is authorized to require occupants of any *premises* that the *code official* identifies as potentially affected by the emergency condition, to vacate the *premises* forthwith or within a time period specified by the *code official*. This order can be communicated verbally, provided that a notice of emergency condition pursuant to Section 116.1.2 is posted as expeditiously as possible.

116.1.2 Posting of notice of emergency condition. Where the *code official* deems an emergency condition to exist, the *code official* shall cause to be posted on all *premises* where such emergency condition exists, a notice that states: (1) an emergency condition exists at or near the posted *premises*; and (2) access, use and/or occupancy of the posted *premises* or a portion thereof is prohibited by the *code official*. The notice shall be posted in the location or locations that the *code official* deems necessary, in the *code official's* sole discretion. Access to the posted *premises* shall be at the discretion of the *code official*, subject as applicable to the requirements for closure of *buildings* with *rental units* as set forth in Section 116.7. Failure to comply with the terms of a posted notice of emergency condition shall be unlawful.

116.1.3 Unauthorized removal or obstruction of posted notice. Unauthorized removal or obstruction of a posted notice of emergency condition is a violation of the *Construction Codes*, and is subject to the penalties provided in Section 113 and DC Official Code § 6-1406 (2018 Repl.) and the injunctive relief set out in DC Official Code § 6-1407 (2018 Repl.). The owner of the *premises* posted with a notice of emergency condition, or the *owner's* agent, shall promptly notify the *Department* if the posted notice has been removed, damaged or obstructed so the notice can be reposted.

116.2 Emergency work. Whenever, in the opinion of the *code official*, an emergency condition exists, the *code official* is authorized to require or to undertake the necessary work to

be done at the *premises* where the emergency condition exists to render such *premises* safe in light of the existing emergency condition, including, but not limited to requiring implementation of temporary safeguards, repairs, *demolition*, or *razing* (any of such work at a *premises* required or undertaken by the *code official* to address an emergency condition being referred to as *emergency work*). The *code official* also is authorized to take such other action(s) as the *code official* deems necessary to address such emergency condition, including, but not limited to employing the necessary labor and materials to perform the necessary *emergency work* at a *premises* as expeditiously as possible.

116.2.1 Compliance with order. Any *person* ordered by the *code official* to undertake *emergency work* at a *premises* pursuant to Section 116.2 shall comply with such order forthwith and complete the *emergency work* within the time period specified by the *code official*. The *code official* is not required to provide the *owner* of the *premises* where an emergency condition is deemed to exist with an opportunity to correct the emergency condition before the *code official* undertakes *emergency work*, or to await the expiration of a time period specified in an order under this section.

116.2.2 Historic buildings. Prior to requiring or undertaking *emergency work* to be undertaken at a *premises* that is a *building* or other *structure* that is listed in the DC or National Register of Historic Places, or a portion thereof, either as an individual listing or as a contributing resource to a listed historic district, the *code official* shall consult with the State Historic Preservation Officer as required by DC Official Code § 6-801 (2018 Repl.).

116.3 Safety perimeter. When necessary for public safety, the *code official* is authorized to temporarily close sidewalks, streets, alleys, *premises* and areas adjacent to a *premises* on which the emergency condition exists, and to temporarily prohibit access thereto.

116.4 Costs of emergency work. Where the *code official* causes *emergency work* to be done at a *premises* pursuant to Section 116.2, any costs incurred by the District of Columbia in the performance of such *emergency work*, and expenses incident thereto, shall be paid from appropriations of the District of Columbia, on certification of the *code official*, and shall be assessed as a tax against the lot on which the emergency condition existed or from which such condition arose as the case may be, carried as a tax on the regular tax rolls, and collected in the same manner as real estate taxes are collected.

116.4.1 Additional costs of emergency work. Costs of *emergency work* shall also be deemed to include, but are not limited to, all expenses incurred for or necessitated by any *emergency work*; costs associated with cleaning the *premises* to comply with the *Construction Codes*, utility removal or disconnection costs; court costs, fines, and penalties; costs of inspectors, testing agencies or experts

retained; costs of testing or surveying; costs of mailings, postings and recordings; and costs of attorney's fees expended for recovering the costs of the corrective action or to obtain or enforce a related order. If the *code official* determines that no other shelter is available to *tenants* or occupants required to vacate *rental units* as a result of a *building* closure pursuant to Section 116, the *code official* has discretion to assess all expenses incident to *tenant* or occupant relocation as a cost of emergency repairs, including, but not limited to, temporary housing, security deposits and the first month's rent if required.

116.5 Remedies not exclusive. Nothing herein shall be deemed to preclude or negate any other penalties or remedies set forth in Section 113, or to preclude conversion of a special assessment lien to an administrative judgment, enforceable in the same manner as any other civil judgment under District of Columbia law, as authorized by DC Official Code § 42-3131.01 (2012 Repl. & 2018 Supp.).

116.6 Other laws. The provisions of Section 116 shall not be deemed to nullify any other provisions of local law governing *razing*, *demolition* or repair of unsafe *structures*, including, but not limited to, the provisions of DC Official Code §§ 6-801 *et seq.* (2018 Repl. Supp.) as amended, DC Official Code §§ 42-3131.01 *et seq.* (2012 Repl. & 2018 Supp.) as amended, or DC Official Code §§ 42-3171.01 *et seq.* (2012 Repl. & 2018 Supp.) as amended.

116.7 Buildings with rental units. Where the *code official* posts a notice of emergency condition pursuant to Section 116 at a *building* with rental units, the *code official* is authorized to order all tenants or occupants to vacate the *premises* where an emergency condition exists. The posted notice shall comply with the requirements of Sections 113.5 and 113.6. If any *tenant* or occupant fails to vacate the *premises* within the time specified in the notice, the *code official* is authorized to order removal of the *tenant* or occupant from the *premises*.

116.7.1 Other rental housing provisions. Where an emergency condition exists, the removal of tenants or occupants from the *premises*, or the service of an order to vacate, pursuant to Section 116 shall not be considered an eviction or notice to vacate under DC Official Code § 42-3505.01 (2012 Repl. & 2018 Supp.). Notwithstanding the foregoing, nothing herein shall be construed to nullify or abrogate any other rights to which a *tenant* is entitled under District laws or regulations, including relocation assistance, the right to reoccupy the rental unit following rehabilitation, or the right to pursue rights and remedies under DC Official Code, Title 42, Chapter 34 (2012 Repl. & 2018 Supp.).

116.8 Removal of notice of emergency condition. A notice of emergency condition posted pursuant to Section 116.1.2 shall be removed only by the *code official*. The *code official* shall remove the posted notice when, in the *code official's* opinion, the emergency condition no longer exists. Any remaining unsafe conditions that do not constitute an emer-

agency condition (as defined in Section 116.1) shall be governed by the provisions of Section 115.

116.9 Appeals. Appeals of *code official* actions pursuant to Section 116 are governed by Section 112.2.1. As provided in Section 112, any such appeal shall not have the effect of staying any notice or order issued pursuant to Section 116.

SECTION 117 POSTING OF OCCUPANT LOAD AND LIVE LOAD SIGNS

117.1 Occupant load. Occupant load signs shall be posted in accordance with Section 1004.3. Rooms or spaces which have multiple use capability shall be posted for the occupant loads of all such uses.

117.1.1 Occupant load calculations. The occupant load calculations shall be determined in accordance with Section 1004.

117.2 Installation of live load signs. Where reduced *live loads* are applied in accordance with the exception to Section 1607.3 in *buildings* erected before July 1, 1925, all such design *live loads* shall be conspicuously posted by the *owner* in that part of each *story* in which they apply, using durable signs of an approved, legible, permanent design, before issuance of a certificate of occupancy or before approval of a final inspection pursuant to Section 109.3.14. It shall be unlawful to remove or deface such notices.

117.3 Restrictions on Loading. It shall be unlawful to place, or cause or permit to be placed, on any floor or roof of a *building*, structure or portion thereof, *loads* greater than permitted by the *Construction Codes*.

SECTION 118 ADDRESSES OF PREMISES

118.1 Purpose. The purpose of the provisions of Section 118 shall be:

1. To establish a formal, legally-based District of Columbia-wide system of assigning addresses to *premises* in order to facilitate their identification.
2. To facilitate protection of the public health and safety by enabling a quicker response time by police, fire, ambulance, and other emergency services.
3. To provide for the efficient delivery of public services, including *building* inspections, health inspections, property mapping, and property tax administration.
4. To establish the minimum requirements for providing *address numbers* on *lot*.

118.2 Administration. The *code official* is authorized to and shall administer the provisions of Section 118, including, but not limited to: assigning addresses to all *lots*, new and existing; and administering the naming of new *private thoroughfares* within the District of Columbia. *Address numbers* are required on all *lots*, new and existing, and the *code official* shall have authority to approve all *address number* assign-

ments on any *lot*. The *code official* is also authorized to order changes in the numbering of any *lot* previously numbered if it is determined that the *address number* being used may endanger the public health and safety.

118.3 Responsibility. When an *address number* is assigned to a *lot*, the *owner* of a *lot* shall provide and maintain the *address number* in compliance with these requirements. A *lot*, which is required to have an *address number* pursuant to the provisions of Section 118, but for which no number has been applied for or issued, or where issued the use or posting thereof does not comply with the requirements of this section, shall not be occupied.

118.4 Definitions. The following words and terms are defined in Chapter 2.

ADDRESS NUMBER (for Section 118)

ADDRESS NUMBER RANGE (for Section 118)

ADDRESS NUMBER SUFFIX (for Section 118)

BLOCK FACE (for Section 118)

CONDOMINIUM LOT (for Section 118)

LOT (for Section 118)

MAIN ENTRANCE (for Section 118)

PRIMARY ADDRESS (for Section 118)

PRIVATE THOROUGHFARE (for Section 118)

PUBLIC THOROUGHFARE (for Section 118)

RECORD LOT (for Section 118)

SECONDARY ADDRESS (for Section 118)

TAX LOT (for Section 118)

THOROUGHFARE (for Section 118)

THOROUGHFARE NAME (for Section 118)

THOROUGHFARE QUADRANT (for Section 118)

THOROUGHFARE SEGMENT (for Section 118)

THOROUGHFARE TYPE (for Section 118)

118.5 Addressing rules—general. The following general addressing rules shall apply to *thoroughfares* in the District of Columbia.

1. The District of Columbia has an existing scheme for addressing and naming of *thoroughfares* that is historic in nature. To the greatest extent possible, Section 118 seeks to maintain that scheme while eliminating conditions created over time that are detrimental to the public safety and welfare of the citizens of the District of Columbia.
2. The existing pattern of alphabetically named and numbered *thoroughfares* found in the District of Columbia shall be maintained.
3. When facing a *thoroughfare quadrant* dividing line (North Capitol Street, East Capitol Street, South Capitol Street or the Mall), the even number addresses are on the right side of the *thoroughfare* and the odd numbers are on the left side of the *thoroughfare*. Diagonal

thoroughfares have even and odd sides that match the parity of the grid direction they most closely resemble; those at 30-degree angles are generally numbered as east-west *thoroughfares*, those at 60-degree angles to the Mall are numbered as north-south *thoroughfares*. The 45-degree angle *thoroughfares* are variable, and should be maintained in their current form.

4. *Address number ranges* are determined based on a numeric progression from the point of origin, which is the United States Capitol, and the four *thoroughfare quadrant* dividing lines listed in Section 118.5.3. Each standard block was initially given an *address number range* of one hundred (100), progressing outward from the Capitol. Streets that commence away from the *street quadrant* dividing lines are examined and the *address number ranges* determined based upon the surrounding *thoroughfares*.
5. *Address number ranges* shall not overlap or create any opportunities for the assignment of duplicate addresses on a given *thoroughfare* within a single *thoroughfare quadrant*. There should be no gaps in the address number ranges if the *thoroughfare* to which the *address number ranges* are applied is continuous.
6. Breaks in *address number ranges* may occur where a *thoroughfare* with a given name is broken into distinct *thoroughfare segments* by a park, water body or other physical barrier. In these cases, the integrity of the address grid shall be maintained, and a gap in the *address number range* created, to signify the break in the *thoroughfare's* continuity.

118.6 Administration of addresses.

118.6.1 Master address file. The *code official* shall maintain a master file of assigned addresses and maintain a master address mapping database, with the assistance of the Office of the Chief Technology Officer.

118.6.2 Code official responsibility. The *code official* shall be responsible for determining whether an address is required for any *lot* and also the conditions under which an address or addresses are to be assigned to any *lot*, including how that address is to be posted and displayed.

118.6.3 Assignment of new addresses. The *code official* shall be responsible for assigning a new address in the following instances:

1. A new *record lot* is created through the subdivision process of the Subdivision Regulations of the District of Columbia, a new *condominium lot* is established or a new *tax lot* is created through the process of the Office of Tax and Revenue and no *address number* was previously assigned to the prior land parcel or is no longer appropriate for the addressing of the new *lot*.
2. Where a new *building* or other *structure* is constructed on a *lot*, and a new address is requested for the *lot* to reflect the *main entrance* of the *building* or other *structure* located on the *lot*.
3. The *owner* of a *building* or other *structure* on a *lot* with multiple entrances to the exterior submits an

application that meets the requirements of Section 118 regarding the assignment of one or more *secondary addresses*.

4. A new *building* or other *structure* is constructed on a *lot* already assigned an address and the *lot* already that contains one or more *buildings* or other *structures*.
5. An *existing building* or other *structure* is renovated to relocate the main entrance to a different *thoroughfare* frontage of the *lot* or to a different location on the current *thoroughfare* frontage of the *lot* on which that *building* or other *structure* has frontage.
7. A *condominium lot* where the unit has direct access to a *public thoroughfare* separate and apart for any *main entrance* to the *building* on the *lot*.
8. Where there is a separate occupiable space on the ground floor of a *building* on a *lot* and that space has direct access to the adjacent *public thoroughfare*, that space may be assigned an address separate from the address of the *lot* and displayed on the *main entrance* of the *building* within which the space is located.
9. Such other instances where it is deemed appropriate by the *code official* that an address be assigned and then displayed.

118.6.4 Authority to waive addressing provisions. The *code official* is authorized to grant a waiver of the provisions of Section 118, based upon the evidence presented, if the *code official* finds that the waiver fulfills all of the following:

1. Benefits the public health, safety and welfare.
2. Does not create conflicts or duplicate addresses.
3. Is in the best interest of the District of Columbia.

118.7 Thoroughfare naming.

118.7.1 General. The following general rules shall apply to naming of *thoroughfares* in the District of Columbia.

1. No *thoroughfare* shall be given a name that duplicates or nearly duplicates the name of a then-existing or previously existing *thoroughfare* within the same *thoroughfare quadrant* of the District of Columbia.
2. No *thoroughfare* shall be given a name that duplicates or nearly duplicates the name of an existing or previously existing *thoroughfare* within the jurisdiction of the District of Columbia.
3. A *thoroughfare name* may be changed according to the separate procedures for naming *public thoroughfares* and *private thoroughfares*. Historical and commonly used names for *thoroughfares* shall be maintained where possible, and linked to newer names where necessary.

118.7.2 Naming of public thoroughfares. The *code official* shall forward a recommendation on the name of any proposed new *public thoroughfare* to the Council of the District of Columbia for its action. A proposed *public*

thoroughfare shall be assigned a name by the Council of the District of Columbia pursuant to Sections 401 through 410 of the Street and Alley Closing and Acquisition Procedures Act of 1982, effective March 10, 1983 [DC Law 4-201; DC Official Code §§ 9-204.01 *et seq.* (2013 Repl. & 2018 Supp.)].

118.7.3 Naming of private thoroughfares. The following rules shall apply to the naming of *private thoroughfares*.

1. A property *owner*, developer, surveyor, or plat proprietor shall make application to the *code official* for approval of a proposed *thoroughfare name* of a new *private thoroughfare* consistent with the existing historic thoroughfare addressing and thoroughfare naming scheme as required by Section 118.5.
2. Upon receipt of the *thoroughfare name* application for a new *private thoroughfare*, the *code official* shall review the proposed name with the District *Department* of Transportation, the District Office of Planning, and the District E-911 Coordinator to ensure that no duplication occurs and that no *private thoroughfares* are created with names that sound alike, or could create confusion for the delivery of emergency and non-emergency services.
3. The *code official* is authorized to recommend to the applicant a list of the existing approved *thoroughfare names* within the District of Columbia for the convenience of the applicant.
4. The *code official* shall approve the naming of newly established *private thoroughfares* within the District of Columbia, including *private thoroughfares* in proposed plats of condominium developments.
5. The *code official* shall notify the applicant within 30 days of the acceptance or rejection of the proposed *thoroughfare name* along with the reasons for the decision, if applicable.
6. The decision of the *code official* regarding the *thoroughfare name* for each *private thoroughfare* shall be final.
7. An unnamed *private thoroughfare* shall be named when two or more addresses exist or are established on such *private thoroughfare*. If the existing addresses are numbered off of the adjoining *public thoroughfare*, then the addresses shall be changed to appropriate addresses using the *thoroughfare name* of the *private thoroughfare*.
8. An *owner* shall consult with the *code official* before a name for the *private thoroughfare* is selected and shall thereafter obtain the *code official's* approval before the name is displayed in accordance with Section 118.10.
9. The *code official* shall recommend changes in a *thoroughfare name* where, in the *code official's* opinion, a valid reason exists for the change of

thoroughfare name. Such reasons include, but are not limited to:

- a. Duplicate *thoroughfare names*.
 - b. Confusion of *thoroughfare names* that sound alike.
 - c. *Thoroughfare names* that are extremely difficult to spell or pronounce.
 - d. *Thoroughfares* that have more than one commonly used name.
 - e. *Thoroughfare names* shall not be changed to reflect changes in property ownership or for personal reasons of the adjoining *owners*.
10. When a *thoroughfare name* change or designation is proposed, the *code official* shall provide notice to the property *owners* abutting the *thoroughfare segment(s)* to be named or changed. If the change is designed to remedy existing duplicate names or confusing names, the property *owners* may be consulted on suggested names for the *thoroughfare*.
 11. Before changing a *thoroughfare name*, the *code official* shall consider the official *thoroughfare name* as recorded on plats and deeds of adjacent property, and the most accurate historical name of the *thoroughfare* in question.
 12. The existing legal documents shall be of primary consideration in determining the single *thoroughfare name* when two or more names are commonly used.

118.8 Address number assignment. The following rules shall apply to *address number* assignments.

1. Every *lot* that is legally capable of supporting a *building* or other *structure* shall have an address regardless of whether that *lot* is occupied by a *building* or other *structure* or vacant.
2. Every *condominium lot*, *building* or other *structure* with an entrance fronting on and directly accessible from a *public thoroughfare* or a *private thoroughfare* shall have a *thoroughfare address*.
3. No address shall be assigned to a driveway. Where a *lot* is improved by a *building* or other *structure* and has a driveway associated with that *building* or other *structure*, whether on the same *lot* or different *lot*, then the driveway shall have the same name and the numbering sequence of the *thoroughfare* assigned to the *lot* on which the *building* or other *structure* is located.
4. No *address number* shall be assigned to a *lot*, and no *building* or other *structure* on that *lot* shall display an address where the *lot* has as its only access an unnamed *thoroughfare*. If an address is required for a *lot* that fronts on an unnamed *thoroughfare*, that *thoroughfare* shall first be named according to the process described in Sections 118.7.2 or 118.7.3, as applicable.

5. An *address number* for a *lot*, or for *premises* on a *lot* where there are multiple *premises* on *lot* that could be assigned an *address number*, shall be determined based upon the address range of the block face, the location of the *main entrance* of the *building* or other *structure*, or, as applicable, the frontage of the *lot* on a *thoroughfare* and the existing *address numbers* that are assigned within that *block face* of the *thoroughfare*.
6. *Address numbers* shall be logically and spatially consistent, increasing in numeric order from the low number end of the *block face* of the *thoroughfare* to the high number end of that *block face*.
7. *Address numbers* shall be assigned in accordance with the parity (odd/even) designation for the *block face* of the *thoroughfare*. Even numbers shall not be used on the odd side of a *thoroughfare*, nor shall odd numbers be used on the evenside of a *thoroughfare*.
8. If a *thoroughfare segment* or an *alley segment* exists where both odd and even numbers exist on both sides of the segment, or where only one side contains addresses, and both odd and even numbers have been used, the *code official* shall issue an *address number* that is logically consistent with the numbers on the adjoining *lots*.
9. No *address number* shall be assigned that duplicates the number for any existing *lot* on the same *thoroughfare*.
10. Except as provided for in Section 118.8.11, Item 11, an *address number* may include an *address number suffix* designated as a letter. Where a new *address number suffix* is designated, it shall be a letter; the first letter assigned to an address as an *address number suffix* shall be the letter “B” to distinguish the address assigned to the principal *building* or other *structure* on the *lot* that has been assigned that address.
11. The *code official* is authorized to maintain an existing *address number suffix* that is a fraction if there is no available *address number* in the address sequence for the block in which the address is located. The fraction shall be stored in the *address number suffix* field.
12. The letter designation of a *thoroughfare* address shall be maintained in the *address number suffix* field.
13. No new *address number* shall be assigned to the site of a proposed *building* that is to be situated on multiple *lots*, although the *address number* assigned to one of the *lots* may be used as the *address number* displayed on the *main entrance*. No new *address number* shall be assigned to the site of a proposed *building* where there is a pending subdivision of the site pursuant to the Subdivision Regulations of the District of Columbia (10-B DCMR §§ 2700 *et seq.*), until the plat of subdivision has been accepted into the records of the Office of the Surveyor of the District of Columbia. No new *address number* shall be assigned to the site of a proposed *building* where there is a pending

division of lots application being process administered by the Office of Tax and Revenue of the District of Columbia, and an *address number* may only be assigned in connection with that division of lots process when that Office has issued to the applicant its notice of theoretical creation of one or more tax lots and associated assignment of assessment and taxation lot number(s) to that *tax lot* or *tax lots*.

14. The *code official* shall hear and consider requests for changes in *address numbers* for existing addresses.
 - a. The *code official* is authorized to change *address numbers* where there are duplicates, or where the *address number* is out of sequence, or is on the opposite side of the *thoroughfare* in terms of parity (odd number found on the even numbered side, or vice-versa).
 - b. The *code official* is authorized to change *address numbers* where existing numbers contain an *address number suffix*, and there is sufficient space in the existing *address number* range for the block face to support renumbering to remove the *address number suffix*.
15. The *code official* shall not change an existing address to one that is not consistent with the addressing of lots and *buildings*, parity, and sequences that already exist on the applicable *public thoroughfare*.
16. Where a lot is occupied by a *building* or other *structure* that fronts on more than one *public thoroughfare*, the lot shall be assigned an *address number* based on the location of the face of the *building* or other *structure* containing the main entrance.

118.9 Display specifications.

118.9.1 Address number display. Each *lot* to which an *address number* has been assigned and has a *building* or other *structure* located on that *lot* shall have the number displayed on the *building* or other *structure* in conformance with the requirements provided in Section 118.9.

118.9.1.1 Main entrance location. The following requirements shall apply to the main entrance location.

1. The assigned *address number* of the *lot* shall be located directly over or near the *main entrance* in a position easily observed and readable from the opposite side of a *public thoroughfare*.
2. A multi-tenanted *building* or other *structure* having separate exterior entrances with separate *address numbers* shall post the assigned *address numbers* near each entrance to the *building* or other *structure* in accordance with this section.
3. Where the *main entrance* of the *building* or other *structure* on a *lot* is not located at and fronting on a *public thoroughfare*, the owner of a *lot* shall post the *address number* on the face of the *building* or other *structure* located at or fronting on the *public thoroughfare* as well as directly above or near the *main entrance*.

118.9.1.2 Rear entrance location. If the rear of a *building* or other *structure* on a *lot*, to which an *address number* has been assigned, faces a *public thoroughfare*, the owner shall also place the *address number* of the *main entrance* in a position easily observed and readable from the *public thoroughfare* that serve the rear of that *building* or other *structure*.

118.9.1.3 Construction sites location. *Address numbers* shall be posted at construction sites in a position easily observed and readable from any *public thoroughfare* serving the construction site.

118.9.1.4 Size of numbers. The minimum size of an *address number* shall be 3 inches (76 mm) high and 1/2 inch (13 mm) wide and shall be in Arabic figures on a contrasting background.

118.9.1.5 Private thoroughfares. The *address number* of a *lot* fronting on a *private thoroughfare* need not be readable from a *public thoroughfare* if, under the circumstances, this requirement would be impracticable and the *approved address numbers* are placed in a position on a *building* or other *structure* on that *lot* to be plainly legible and visible from the *private thoroughfare*.

118.9.2 Thoroughfare name sign display specifications. *Thoroughfare name* signs shall conform to all of the following specifications, as applicable:

1. All *thoroughfare name* signs for a *public thoroughfare* or *private thoroughfare* shall meet the requirements of Section 118.7 above and the requirements of the District Department of Transportation (DDOT).
2. For *public thoroughfares*, DDOT shall provide standard *thoroughfare name* signs showing the name of the *public thoroughfare*, the *thoroughfare type*, *thoroughfare quadrant*, and the starting number for the *address range(s)* associated with the *thoroughfare segment* for each *public thoroughfare* at each intersection.
3. The *owner* of a *private thoroughfare* shall provide standard *thoroughfare name* signs showing the name of the *private thoroughfare*, the *thoroughfare type*, *thoroughfare quadrant*, and the starting number for the *address range(s)* associated with the *thoroughfare segment* for each *private thoroughfare*, based on the *approved thoroughfare name* issued by the *code official*.
4. *Thoroughfare name* signs designating *private thoroughfares* shall include the word "Private" or "PVT" on them to distinguish them from *public thoroughfares*.

118.10 Compliance and enforcement.

118.10.1 Final building inspection. Before approval of a final *building* inspection pursuant to Section 109.3.1.11, all addressing requirements, including obtaining a *thoroughfare name*, and obtaining and posting of an *address number*, shall be satisfied in accordance with the requirements of Section 118.

118.10.2 Enforcement. The provisions of Section 118 shall be enforced by the *code official* pursuant to the enforcement mechanisms set forth in Section 113.

SECTION 119 SERVICE UTILITIES

119.1 Connection of service utilities. No *person* shall make connections from a utility source of energy, fuel, power, water or sewerage to any *building*, other *structure* or system that is regulated by the *Construction Codes* until a permit for the work is issued and the work has been inspected and approved by the *code official*.

119.2 Temporary connection. The *code official* shall have the authority to authorize the temporary connection of a *building*, other *structure*, system, or use to the utility source of energy, fuel or power.

119.3 Authority to disconnect service utilities. The *code official* shall have the authority to order the disconnection of utility service to any *building*, other *structure* or system regulated by the *Construction Codes*, in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without the approval required by Section 119.1 or 119.2. The *code official* shall notify the serving utility, and where possible the owner and occupant of the *building*, other *structure* or service system, of the decision to disconnect prior to taking such action. If not notified prior to disconnecting, the *owner* or occupant of the *building*, other *structure* or service system shall be notified in writing, as soon as practical thereafter.

119.3.1 Nonemergency disconnection. The *code official* shall have the authority to disconnect any utility service or energy supplied to a *premises* or portion thereof, or to equipment located thereon, where notification has been provided in accordance with Section 119.3.1.1, in any of the following circumstances:

1. The *owner* of the *premises*, or *person* working on the *premises*, have failed to comply with one or more stop work orders.
2. Where an electric or natural gas service has been connected to a *building* or *structure* which has not been *approved* for occupancy or operation at that site.
3. Where a permit for temporary power has expired and the electrical connection is still in use.

119.3.1.1 Notification. The *code official* shall issue a notice and order directed to the *owner* of the *premises* or portion thereof that is subject to the disconnection order in accordance with Sections 113.4.6 and 113.5.5, and by posting the notice at the entrance of such *building* or *structure*.

119.3.1.2 Authority to order disconnection. If the specified action to be taken by the *owner* is not accomplished within 30 days from the date of service, the *code official* is authorized to order the utility to disconnect service, with the costs for such action to be borne by the *owner*. Responsibility for damages, losses, and

liabilities consequent with the loss of power shall be borne by the *owner* and not the District of Columbia or its employees.

Exception: Where the *owner* or *occupant* can conclusively demonstrate the likelihood of loss of human life or serious health endangerment consequent to a loss of power to the site and, further, can conclusively demonstrate inability to provide alternative living arrangements for the endangered person.

119.3.1.2.1 Notice to the Serving Utility. When utility service or energy to a *premises* or portion thereof is to be disconnected, a written notice of such disconnection and causes therefore shall be provided at least twenty-four (24) hours prior to such disconnection to the serving utility, the *owner* and the *occupants* of the *premises* or portion thereof.

119.3.1.2.2 Posting of Notice of Disconnection. After any notice and/or order of the *code official* made pursuant to this section shall become final, the *code official* shall post a notice of disconnection in a conspicuous location, in or about the *premises* subject to the disconnection stating that the utility/energy connection, as applicable, will be disconnected on a specified date. Unauthorized removal or obstruction of a posted notice of disconnection is a violation of the *Construction Codes*, and is subject to the penalties provided in Section 113 and DC Official Code § 6-1406 (2018 Repl.), and the injunctive relief set out in DC Official Code § 6-1407 (2018 Repl.). The *owner* of the *premises* posted with a notice of disconnection, or the owner's agent, shall promptly notify the *Department* if the posted notice has been removed, damaged or obstructed so the notice can be reposted.

SECTION 120 COVENANTS AND AGREEMENTS

120.1 General. The provisions of this section, and DC Official Code § 6-1405.01(b) (2018 Repl.), shall apply to any covenants or agreements required by the *Construction Codes* or accepted by the *code official* as an alternative means of compliance with requirements of the *Construction Codes* (a *required covenant*). There may also be other covenants or agreements relating to the construction process that are required by other agencies as set forth in Section 120.4, that are subject to review and approval by these agencies (other agency covenant).

120.1.1 Required covenants. *required covenants* include the following:

1. Covenant for openings (Section 705.8.7 of this code or Section 302.1 of the *Residential Code*).
2. Covenant for Green Building Act binding pledge (Section 302.6.2.4 of the *Green Construction Code*).
3. Covenant for modification of projection requirements (Section 3202.4.2).

4. Covenant for master service or master metering (Articles 230.2 and 230.3 of the *Electrical Code*).
5. Covenants required by the Zoning Administrator.
6. Covenants and agreements required or accepted by the *code official* as an alternative means of compliance with requirements of the *Construction Codes*, in conjunction with an *approved* code modification.

120.2 Form and recordation. Any *required covenant* shall: (a) run with the land for as long as it is required; (b) be in the form *approved* by the Office of the Attorney General for the District of Columbia (OAG); (c) require approval for technical sufficiency by the *Department* or other responsible agency indicated below, as shown by the signature of the authorized representative of the *Department* or other agency; and (d) require approval for legal sufficiency by OAG or OAG's designee, before issuance of any related permits, certificates of occupancy for Green Building Pledge Covenants, or Change in Openings as specified in Section 120.3.1.1. as shown by the signature of the authorized representative of OAG on the *required covenant*. Any modification or termination of a Covenant shall require: prior written approval of the District of Columbia in a form *approved* by OAG; approval for technical sufficiency by the *Department* (or other agency indicated below); and approval for legal sufficiency by OAG or OAG's designee. For each *required covenant*, the *owner(s)* shall:

1. File and record the *required covenant*, signed by the *owner(s)* as *approved* by the *Department* (or other agency as required below) and by OAG or OAG's designee, among the land records of the Office of the Recorder of Deeds of the District of Columbia (Land Records) against the title to the lot on which the *building* or *structure* is located or to be located, by and at the expense of the *owner*.
2. Provide the *code official* with one copy of the *required covenant* that is certified by the Recorder of Deeds as having been recorded among the land records against the lot.
3. Cause any lien or interest creating a security interest for the payment of a debt in the *premises*, as applicable, recorded in the land records prior to the *required covenant*, to be subordinated to the *required covenant*.

120.3 Specific categories of required covenants.

120.3.1 Required covenant for openings. No permit shall be *approved* or issued where one or more openings in an exterior wall, subject to the provisions of Section 705.8.7 of this code or Section 302.1 of the *Residential Code*, until the *owner* of the lot presents the *code official* with a copy of a covenant that complies with Section 120.2. The purpose of the covenant is to ensure compliance with maintenance of the minimum requirements of Section 705.8.7 of this code and Section 302.1 of the *Residential Code* for as long as the *building* exists, and to ensure that responsibility for the maintenance of those conditions shall be conveyed to any future owner of the *building*.

120.3.1.1 Change in openings. If the *code official* determines that a change in conditions subject to Section 705.8.7 of this code or Section 302.1 of the *Residential Code* occurred prior to final inspection, but after recordation of a covenant required by Section 120.3.1, and the change affects the terms of the covenant, the owner shall amend the covenant as the *code official* directs and record the amended covenant in accordance with Section 120.1 prior to issuance of the first certificate of occupancy for occupiable space in a *story above grade plane*, or prior to final inspection if no certificate of occupancy is required.

120.3.2 Required covenants for modifications of projection requirements for foregone construction. No permit or related plan shall be *approved* or issued for a modification of projection requirements pursuant to Section 3202.4.2 until the *owner* of the *premises* presents the *code official* with a copy of a covenant that complies with Section 120.2, and which meets the requirements of Sections 3202.4.2.4 and 3202.4.2.5.

120.3.3 Required covenants for Green Building Act Binding Pledge. No certificate of occupancy in a *story above grade plane* for a project for which the *owner* or authorized agent has elected to submit a binding pledge as provided in Section 302.6.2.4 of the *Green Construction Code* as security for compliance with the provisions of Section 302.3.2 or Section 302.3.3 of the *Green Construction Code* or as provided in Section 6 of the Green Building Act (DC Official Code Section § 6-1451.05) until the *owner* or authorized agent presents the *code official* with a copy of a covenant that complies with Section 120.2.

120.3.4 Required covenants for master service or master metering. No permit shall be *approved* or issued to provide master service to more than one *building* on a single lot, or to *buildings* on different lots in the same square, as *approved* pursuant to Articles 230.2 and 230.3 of the *Electrical Code*, until the *owner* of the *premises* presents the *code official* with a copy of a covenant, complying with Section 120.2, that establishes access rights to each end user.

120.3.5 Covenants required by the Zoning Administrator. No building permit shall be approved or issued for a single family *dwelling* project where the application shows components of an additional *dwelling unit(s)*, unless the *owner* commits to maintain the unit as a single family *dwelling* for purposes of compliance with the *Zoning Regulations* or seeks, as appropriate, regulatory approval as either an accessory apartment, flat, or multiple dwelling use as permitted under the *Zoning Regulations*. If maintained as a single family *dwelling*, a commitment to maintain the *premises* as a single family *dwelling* must be documented by the *owner* of the *premises* by presenting the *code official* with a copy of a covenant, complying with Section 120.2.

120.4 Other agency covenants and agreements. Where an agency other than the *Department* requires a covenant or agreement to be *approved* by such agency prior to permit

issuance by the *Department*, then it shall be the responsibility of the requiring agency to ensure that the applicant has met the conditions imposed by such agency, and to provide evidence to the *Department* of the requiring agency's approval of such covenant or agreement. Agreements and covenants required by other agencies include, but are not limited to, the following:

1. Covenants for stormwater management (DOEE, pursuant to 21 DCMR, Chapter 5).
2. Covenants for private fire hydrants (Fire and Emergency Medical Services, pursuant to DC Official Code § 34-2410.02 and Section 507.5.2.1 of the *Fire Code*).
3. Public space vault agreements (DDOT, pursuant to DC Official Code § 10-1103.01 and Section 3202.9.2.1).
4. Covenants or agreements for installation and maintenance of water service or sewer pipes that traverse an adjacent premises. (DC Water, pursuant to DC Code § 8-205(b) and 21 DCMR §§ 110 and 202).
5. Covenants and nonconversion agreements required under flood hazard rules (DOEE, pursuant to 21 DCMR, Chapter 31).

SECTION 121 [RESERVED]

SECTION 122 AMENDMENTS AND COPIES

122.1 Amendments; supplements; editions. All future amendments, supplements, and editions of the *Construction Codes* shall be adopted only upon authority of the government of the District of Columbia. The Mayor is authorized to issue proposed rules to amend the *Construction Codes* and to adopt new editions of and supplements to the *International Codes* in whole or in part, pursuant to Title I of the District of Columbia Administrative Procedure Act, *approved* October 21, 1968 [82 Stat. 1204; DC Official Code §§ 2-501 *et seq.* (2016 Repl. & 2018 Supp.)] and the Construction Codes Approval and Amendments Act, effective March 21, 1987 (DC Law 6-216; DC Official Code §§ 6-1401 *et seq.* (2018 Repl.)), as amended. The Mayor's authority thereunder has been delegated to the Construction Codes Coordinating Board (CCCB) pursuant to Mayor's Order 2009-22, dated February 25, 2009, as amended. The proposed rules shall be submitted to the Council for a 45-day period of review, excluding Saturdays, Sundays, legal holidays and days of Council recess, pursuant to DC Official Code § 6-1409(a). If the Council does not approve or disapprove the proposed rules, in whole or in part, by resolution within this 45-day review period, the proposed rules shall be deemed *approved*. The rules shall not take effect until *approved* or deemed *approved* by the Council.

Exception: Amendments to the *Construction Codes* by emergency rulemaking are governed by DC Official Code § 2-505(c).

122.2 Amendment procedure. Within a reasonable period of time after publication of any subsequent edition of the *International Codes*, the CCCB shall:

1. Review, revise and maintain the *Construction Codes* to reflect the current state of the art in the construction industry.
2. Review and evaluate all proposed changes and amendments to the *Construction Codes*.
3. Submit for adoption, as proposed rulemaking through the Director, all revisions to the *Construction Codes* that are *approved* by the CCCB.
4. Publish, as final rulemaking through the Director, all revisions to the *Construction Codes* once they are *approved* or deemed *approved* by the Council as provided in the Construction Codes Act and Section 122.1.

122.2.1 Initiation and review of changes. Changes to the *Construction Codes* shall be proposed and initiated by and through the CCCB. The notice, review, evaluation and rulemaking procedures of Section 122.2 shall be applied to any proposed changes in the *Construction Codes*.

122.3 Official copy. The official copy of the *Construction Codes* is posted electronically on the website of the Secretary of the District of Columbia, Office of Documents and Administrative Issuances.

SECTION 123 TRANSITORY PROVISIONS

123.1 Applicability of prior editions of the Construction Codes. The prior edition of the *Construction Codes*, in force on the date that a new edition of the *Construction Codes* is adopted pursuant to Section 122, shall remain in full force and effect for the purposes specified in Sections 123.1.1 through 123.1.5.

123.1.1 Permits issued prior to adoption of Construction Codes. Work authorized by a permit issued before the effective date of the new edition of the *Construction Codes*, which permit has not expired pursuant to Section 105.10 or been revoked pursuant to Section 111, shall be allowed to be carried to completion under the edition of the *Construction Codes* under which the permit was issued, subject to the exceptions stated in Section 102.6.

123.1.2 Applications filed prior to adoption of Construction Codes. An application for permit for which the application filing deposit has been paid before the effective date of the new edition of the *Construction Codes*, pursuant to Section 108.2.1.1, shall be allowed to be processed to issuance of the permit, and any work authorized thereby shall be allowed to be carried to completion under the edition of the *Construction Codes* in effect on the date said application was filed, subject to the exceptions stated in Section 102.6 and the following conditions:

1. Each such application shall have been filed prior to the effective date of the new edition of the *Construction Codes* accompanied by submittal documents and other information sufficiently complete to allow

processing of the permit application without substantial change or deviation.

2. Each such permit shall be paid in full and obtained by the applicant within 12 months after the effective date of the new edition of the *Construction Codes*.
3. All work authorized by such permit shall be carried to completion under the terms of the permit.
4. Any permits granted under Section 123.1.2, if permitted to expire under Section 105.10 or if revoked pursuant to Section 111, shall not be extended under Section 105.11.

123.1.3 Applications filed after adoption of Construction Codes. Where a contract for design has been executed prior to the effective date of the new edition of the *Construction Codes*, but no permit applications for work covered by the design contract have been filed, permit applications for work covered by the design contract shall be allowed to be filed, processed to issuance of permit, and any work authorized thereby shall be allowed to be carried to completion, under the previous edition of the *Construction Codes*, subject to the exceptions stated in Section 102.6 and the following conditions:

1. The applicant shall file the permit application, accompanied by submittal documents and other information conforming to Sections 106.1 and 106.1.1 of the new edition of the *Construction Codes*, sufficiently complete to allow processing of the permit without substantial change or deviation, within 12 months after the effective date of the new edition of the *Construction Codes*.
2. The applicant shall submit a copy of the design contract for the work covered by the permit application, with a notarized affidavit stating that the submitted copy is a true and accurate copy of the contract, that the contract was in effect on or before the effective date of the *Construction Codes*, and that the design submitted with the permit application was made under such contract.
3. The permit shall be obtained and the permit fee paid in full by the applicant within 12 months after the filing date.
4. All work authorized by such permit shall be carried to completion under the terms of the permit.
5. Any permit granted under Section 123.1.3, if permitted to expire under Section 105.10 or if revoked pursuant to Section 111, shall not be extended under Section 105.11.

123.1.4 Tenant layout permits in a new building. The work necessary to finish the interior layout of every tenant space in a new *building* authorized by a permit issued under a previous edition of the *Construction Codes*, for first occupancy of each such tenant space, shall be considered part of the completion of said *building*, and the permits for such tenant work shall be allowed to be processed under the same edition of the *Construction Codes* as the permit for the new *building*, regardless of when the tenant layout project begins.

123.1.4.1 Extensive Alteration Level 3 projects. The work necessary to finish the interior layout of every tenant space in Alteration Level 3 projects that entails all of the following: a) stripping the building to its structure, b) removal of all other systems, and c) the complete refitting of the building, shall be considered part of the completion of said *building*, and the permits for such tenant work shall be allowed to be processed under the same edition of the *Construction Codes* as the permit for the Alteration Level 3 work, regardless of when the tenant layout project began.

123.1.5 Revision of a permit issued under a prior edition of the Construction Codes. Revisions pursuant to Section 105.9 of an active valid *permit* issued under a previous edition of the *Construction Codes* shall be allowed to be processed, at the option of the *owner*, under the same edition of the *Construction Codes* as the *permit* being revised.

Exceptions: Where the *code official* determines either of the following:

1. Using certain provisions of the previous edition would pose an undue health or safety risk to the public or the occupants of the *premises*.
2. The scope of work is such that submission of a new permit application is required in lieu of a permit revision as authorized by Sections 105.9 and 109.1.

CHAPTER 2

DEFINITIONS

SECTION 201 GENERAL

201.1 Scope. Unless otherwise expressly stated, the following words and terms shall, for the purposes of this code, have the meanings shown in this chapter.

201.2 Interchangeability. Words used in the present tense include the future; words stated in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular.

201.3 Terms defined in other codes. Where terms are not defined in this code and are defined in the *Energy Conservation Code*, *Fuel Gas Code*, *Fire Code*, *Mechanical Code* or *Plumbing Code*, such terms shall have the meanings ascribed to them as in those codes.

201.4 Terms not defined. Where terms are not defined through the methods authorized by this section, such terms shall have ordinarily accepted meanings such as the context implies.

201.5 Defined terms with specific limitations. Where the definition of a term is shown as being specifically limited to a specific chapter or section of the *Construction Codes*, that definition shall not be used outside the chapter or section specifically stated.

SECTION 202 GENERAL DEFINITIONS

202.1 Revised definitions. The definitions of the following terms in Section 202 of the *International Building Code* are deleted and new definitions are inserted in their place in Section 202 of the *Building Code*.

24-HOUR BASIS. The actual time that a person is an occupant within a facility for the purpose of receiving care. It shall not include a facility that is open for 24 hours and is capable of providing care to someone visiting the facility during any segment of the 24 hours.

AAC MASONRY. Masonry made of autoclaved aerated concrete (AAC) units, manufactured without internal reinforcement and bonded together using thin- or thick-bed mortar.

ACCESSIBLE. A site, building, facility or portion thereof that complies with Chapter 11.

ACCESSIBLE MEANS OF EGRESS. A continuous and unobstructed way of egress travel from any accessible point in a building or facility to a public way.

ACCESSIBLE ROUTE. A continuous, unobstructed path that complies with Chapter 11.

ACCESSIBLE UNIT. A dwelling unit or sleeping unit that complies with this code and the provisions for Accessible units in ICC A117.1.

ACCREDITATION BODY. An approved, third-party organization that is independent of the grading and inspection agencies, and the lumber mills, and that initially accredits and subsequently monitors, on a continuing basis, the competency and performance of a grading or inspection agency related to carrying out specific tasks.

ADDITION. An extension or increase in the building area, aggregate floor area, number of stories, or height of a building or structure.

ADHERED MASONRY VENEER. Veneer secured and supported through the adhesion of an approved bonding material applied to an approved backing.

ADOBE CONSTRUCTION. Construction in which the exterior load-bearing and nonload-bearing walls and partitions are of unfired clay masonry units, and floors, roofs and interior framing are wholly or partly of wood or other approved materials.

Adobe, stabilized. Unfired clay masonry units to which admixtures, such as emulsified asphalt, are added during the manufacturing process to limit the units' water absorption so as to increase their durability.

Adobe, unstabilized. Unfired clay masonry units that do not meet the definition of "Adobe, stabilized."

AEROSOL. A product that is dispensed from an aerosol container by a propellant. Aerosol products shall be classified by means of the calculation of their chemical heats of combustion and shall be designated Level 1, Level 2 or Level 3.

Level 1 aerosol products. Those with a total chemical heat of combustion that is less than or equal to 8,600 British thermal units per pound (Btu/lb) (20 kJ/g).

Level 2 aerosol products. Those with a total chemical heat of combustion that is greater than 8,600 Btu/lb (20 kJ/g), but less than or equal to 13,000 Btu/lb (30 kJ/g).

Level 3 aerosol products. Those with a total chemical heat of combustion that is greater than 13,000 Btu/lb (30 kJ/g).

AEROSOL CONTAINER. A metal can or a glass or plastic bottle designed to dispense an aerosol.

AGGREGATE. In roofing, crushed stone, crushed slag or water-worn gravel used for surfacing for roof coverings.

AGRICULTURAL BUILDING. A structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products. This structure shall not be a place of human habitation or a place of employment where agricultural products are processed, treated or packaged, nor shall it be a place used by the public.

AIR-IMPERMEABLE INSULATION. An insulation having an air permeance equal to or less than $0.02 \text{ l/s} \times \text{m}^2$ at 75 pa pressure differential tested in accordance with ASTM E2178 or ASTM E283.

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AIR-INFLATED STRUCTURE. A structure that uses air-pressurized membrane beams, arches or other elements to enclose space. Occupants of such a structure do not occupy the pressurized area used to support the structure.

AIR-SUPPORTED STRUCTURE. A structure wherein the shape of the structure is attained by air pressure and occupants of the structure are within the elevated pressure area. Air-supported structures are of two basic types:

Double skin. Similar to a single skin, but with an attached liner that is separated from the outer skin and provides an airspace which serves for insulation, acoustic, aesthetic or similar purposes.

Single skin. Where there is only the single outer skin and the air pressure is directly against that skin.

AISLE. An unenclosed *exit access* component that defines and provides a path of egress travel.

AISLE ACCESSWAY. That portion of an *exit access* that leads to an *aisle*.

ALARM NOTIFICATION APPLIANCE. A *fire alarm system* component such as a bell, horn, speaker, light or text display that provides audible, tactile or visible outputs, or any combination thereof.

ALARM SIGNAL. A signal indicating an emergency requiring immediate action, such as a signal indicative of fire.

ALARM VERIFICATION FEATURE. A feature of *automatic* fire detection and alarm systems to reduce unwanted alarms wherein *smoke detectors* report alarm conditions for a minimum period of time, or confirm alarm conditions within a given time period, after being *automatically* reset, in order to be accepted as a valid alarm-initiation signal.

ALLOWABLE STRESS DESIGN. A method of proportioning structural members, such that elastically computed stresses produced in the members by *nominal loads* do not exceed *specified* allowable stresses (also called “working stress design”).

ALTERATION. Any construction or renovation to an *existing structure* other than *repair* or *addition*.

ALTERNATING TREAD DEVICE. A device that has a series of steps between 50 and 70 degrees (0.87 and 1.22 rad) from horizontal, usually attached to a center support rail in an alternating manner so that the user does not have both feet on the same level at the same time.

AMBULATORY CARE FACILITY. Buildings or portions thereof used to provide medical, surgical, psychiatric, nursing or similar care on a less than 24-hour basis to persons who are rendered *incapable of self-preservation* by the services provided.

ANCHOR BUILDING. An exterior perimeter building of a group other than H having direct access to a *covered or open mall building* but having required *means of egress* independent of the mall.

ANCHORED MASONRY VENEER. *Veneer* secured with *approved* mechanical fasteners to an *approved backing*.

ANNULAR SPACE. The opening around the penetrating item.

ANNUNCIATOR. A unit containing one or more indicator lamps, alphanumeric displays or other equivalent means in which each indication provides status information about a circuit, condition or location.

APPROVED. Acceptable to the *building official*.

APPROVED AGENCY. An established and recognized agency that is regularly engaged in conducting tests or furnishing inspection services, where such agency has been *approved* by the *building official*.

APPROVED FABRICATOR. An established and qualified person, firm or corporation *approved* by the *building official* pursuant to Chapter 17 of this code.

APPROVED SOURCE. An independent person, firm or corporation, *approved* by the *building official*, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses.

AREA (for masonry).

Gross cross-sectional. The *area* delineated by the out-to-out *specified* dimensions of *masonry* in the plane under consideration.

Net cross-sectional. The *area of masonry units*, grout and *mortar* crossed by the plane under consideration based on out-to-out *specified* dimensions.

AREA, BUILDING. The area included within surrounding *exterior walls* (or *exterior walls* and *fire walls*) exclusive of vent *shafts* and *courts*. Areas of the building not provided with surrounding walls shall be included in the building area if such areas are included within the horizontal projection of the roof or floor above.

AREA OF REFUGE. An area where persons unable to use *stairways* can remain temporarily to await instructions or assistance during emergency evacuation.

AREA OF SPORT ACTIVITY. That portion of an indoor or outdoor space where the play or practice of a sport occurs.

AREAWAY. A subsurface space adjacent to a building open at the top or protected at the top by a grating or *guard*.

ASSEMBLY SEATING, MULTILEVEL. See “Multilevel assembly seating.”

ATRIUM. An opening connecting two or more *stories* other than enclosed *stairways*, elevators, hoistways, escalators, plumbing, electrical, air-conditioning or other equipment, which is closed at the top and not defined as a mall. *Stories*, as used in this definition, do not include balconies within assembly groups or *mezzanines* that comply with Section 505.

ATTIC. The space between the ceiling beams of the top *story* and the roof rafters.

AUDIBLE ALARM NOTIFICATION APPLIANCE. A notification appliance that alerts by the sense of hearing.

AUTOCLAVED AERATED CONCRETE (AAC). Low density cementitious product of calcium silicate hydrates, whose material specifications are defined in ASTM C1386.

AUTOMATIC. As applied to fire protection devices, a device or system providing an emergency function without

the necessity for human intervention and activated as a result of a predetermined temperature rise, rate of temperature rise or combustion products.

AUTOMATIC FIRE-EXTINGUISHING SYSTEM. An *approved* system of devices and equipment which *automatically* detects a fire and discharges an *approved* fire-extinguishing agent onto or in the area of a fire.

AUTOMATIC SMOKE DETECTION SYSTEM. A *fire alarm system* that has initiation devices that utilize *smoke detectors* for protection of an area such as a room or space with detectors to provide early warning of fire.

AUTOMATIC SPRINKLER SYSTEM. An *automatic sprinkler system*, for fire protection purposes, is an integrated system of underground and overhead piping designed in accordance with fire protection engineering standards. The system includes a suitable water supply. The portion of the system above the ground is a network of specially sized or hydraulically designed piping installed in a structure or area, generally overhead, and to which *automatic* sprinklers are connected in a systematic pattern. The system is usually activated by heat from a fire and discharges water over the fire area.

AUTOMATIC WATER MIST SYSTEM. A system consisting of a water supply, a pressure source, and a distribution piping system with attached nozzles, which, at or above a minimum operating pressure, defined by its listing, discharges water in fine droplets meeting the requirements of NFPA 750 for the purpose of the control, suppression or extinguishment of a fire. Such systems include wet-pipe, dry-pipe and preaction types. The systems are designed as engineered, preengineered, local-application or total-flooding systems.

AVERAGE AMBIENT SOUND LEVEL. The root mean square, A-weighted sound pressure level measured over a 24-hour period, or the time any person is present, whichever time period is less.

AWNING. An architectural projection that provides weather protection, identity or decoration and is partially or wholly supported by the building to which it is attached. An awning is comprised of a lightweight *frame structure* over which a covering is attached.

BACKING. The wall or surface to which the *veneer* is secured.

BALANCED DOOR. A door equipped with double-pivoted hardware so designed as to cause a semicounterbalanced swing action when opening.

BALED COTTON. A natural seed fiber wrapped in and secured with industry accepted materials, usually consisting of burlap, woven polypropylene, polyethylene or cotton or sheet polyethylene, and secured with steel, synthetic or wire bands or wire; also includes linters (lint removed from the cottonseed) and motes (residual materials from the ginning process).

BALED COTTON, DENSELY PACKED. Cotton made into banded bales with a packing density of not less than 22 pounds per cubic foot (360 kg/m³), and dimensions complying with the following: a length of 55 inches (1397 mm), a

width of 21 inches (533.4 mm) and a height of 27.6 to 35.4 inches (701 to 899 mm).

BALLAST. In roofing, ballast comes in the form of large stones or paver systems or light-weight interlocking paver systems and is used to provide uplift resistance for roofing systems that are not adhered or mechanically attached to the *roof deck*.

BARRICADE. A structure that consists of a combination of walls, floor and roof, which is designed to withstand the rapid release of energy in an *explosion* and which is fully confined, partially vented or fully vented; or other effective method of shielding from explosive materials by a natural or artificial barrier.

Artificial barricade. An artificial mound or revetment a minimum thickness of 3 feet (914 mm).

Natural barricade. Natural features of the ground, such as hills, or timber of sufficient density that the surrounding exposures that require protection cannot be seen from the magazine or building containing explosives when the trees are bare of leaves.

BASE FLOOD. A flood having a 1-percent chance of being equaled or exceeded in any given year. The base flood is commonly referred to as the “100 year flood” or the “1-percent-annual chance flood.”

BASE FLOOD ELEVATION. The elevation of the *base flood*, including wave height, relative to the National Geodetic Vertical Datum (NGVD), North American Vertical Datum (NAVD) or other datum specified on the *Flood Insurance Rate Map* (FIRM).

BASEMENT. A *story* that is not a *story above grade plane* (see “*Story above grade plane*”). This definition of “Basement” does not apply to the provisions of Section 1612 or Appendix G for *flood loads*.

BASEMENT (for flood loads) (for purposes of Section 1612 and Appendix G). The portion of a building having its floor subgrade (below ground level) on all sides. This definition of “Basement” is limited in application to the provisions of Section 1612 and Appendix G.

BEARING WALL STRUCTURE. A building or other structure in which vertical *loads* from floors and roofs are primarily supported by walls.

BED JOINT. The horizontal layer of *mortar* on which a *masonry unit* is laid.

BLEACHERS. Tiered seating supported on a dedicated structural system and two or more rows high and is not a building element (see “*Grandstand*”).

BOARDING HOUSE. A building arranged or used for lodging for compensation, with or without meals, and not occupied as a single-family unit.

BOILING POINT. The temperature at which the vapor pressure of a *liquid* equals the atmospheric pressure of 14.7 pounds per square inch (psia) (101 kPa) or 760 mm of mercury. Where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, for the purposes of this classification, the 20-percent evaporated point of a distillation performed in

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accordance with ASTM D86 shall be used as the boiling point of the *liquid*.

BRACED WALL LINE. A straight line through the building plan that represents the location of the lateral resistance provided by the wall bracing.

BRACED WALL PANEL. A full-height section of wall constructed to resist in-plane shear loads through interaction of framing members, sheathing material and anchors. The panel's length meets the requirements of its particular bracing method and contributes toward the total amount of bracing required along its *braced wall line*.

BREAKOUT. For revolving doors, a process whereby wings or door panels can be pushed open manually for *means of egress* travel.

BRICK.

Calcium silicate (sand lime brick). A pressed and subsequently autoclaved unit that consists of sand and lime, with or without the inclusion of other materials.

Clay or shale. A solid or hollow *masonry unit* of clay or shale, usually formed into a rectangular *prism*, then burned or fired in a kiln; brick is a ceramic product.

Concrete. A concrete *masonry unit* made from Portland cement, water, and suitable aggregates, with or without the inclusion of other materials.

BUILDING. Any structure used or intended for supporting or sheltering any use or occupancy.

BUILDING AREA. See "Area, building."

BUILDING ELEMENT. A fundamental component of building construction, listed in Table 601, which may or may not be of fire-resistance-rated construction and is constructed of materials based on the building type of construction.

BUILDING HEIGHT. See "Height, building."

BUILDING-INTEGRATED PHOTOVOLTAIC (BIPV) PRODUCT. A building product that incorporates photovoltaic modules and functions as a component of the building envelope.

BUILDING LINE. The line established by law, beyond which a building shall not extend, except as specifically provided by law.

BUILDING OFFICIAL. The *code official*.

BUILT-UP ROOF COVERING. Two or more layers of felt cemented together and surfaced with a cap sheet, mineral aggregate, smooth coating or similar surfacing material.

CABLE-RESTRAINED, AIR-SUPPORTED STRUCTURE. A structure in which the uplift is resisted by cables or webbings which are anchored to either foundations or dead men. Reinforcing cable or webbing is attached by various methods to the membrane or is an integral part of the membrane. This is not a cable-supported structure.

CANOPY. A permanent structure or architectural projection of rigid construction over which a covering is attached that provides weather protection, identity or decoration. A canopy is permitted to be structurally independent or supported by attachment to a building on one or more sides.

CARBON DIOXIDE EXTINGUISHING SYSTEMS. A system supplying carbon dioxide (CO₂) from a pressurized vessel through fixed pipes and nozzles. The system includes a manual- or *automatic*-actuating mechanism.

CARE SUITE. In Group I-2 occupancies, a group of treatment rooms, care recipient sleeping rooms and the support rooms or spaces and circulation space within the suite where staff are in attendance for supervision of all care recipients within the suite, and the suite is in compliance with the requirements of Section 407.4.4.

CAST STONE. A building stone manufactured from Portland cement concrete precast and used as a *trim*, *veneer* or facing on or in buildings or structures.

CEILING LIMIT. The maximum concentration of an airborne contaminant to which one may be exposed. The ceiling limits utilized are those published in DOL 29 CFR Part 1910.1000. The ceiling Recommended Exposure Limit (REL-C) concentrations published by the U.S. National Institute for Occupational Safety and Health (NIOSH), Threshold Limit Value—Ceiling (TLV-C) concentrations published by the American Conference of Governmental Industrial Hygienists (ACGIH), Ceiling Workplace Environmental Exposure Level (WEEL-Ceiling) Guides published by the American Industrial Hygiene Association (AIHA), and other *approved*, consistent measures are allowed as surrogates for hazardous substances not listed in DOL 29 CFR Part 1910.1000.

CEILING RADIATION DAMPER. A *listed* device installed in a ceiling membrane of a fire-resistance-rated floor/ceiling or roof/ceiling assembly to limit *automatically* the radiative heat transfer through an air inlet/outlet opening. Ceiling radiation dampers include air terminal units, ceiling dampers and ceiling air diffusers.

CELL (Group I-3 occupancy). A room within a housing unit in a detention or correctional facility used to confine inmates or prisoners.

CELL (masonry). A void space having a gross cross-sectional *area* greater than 1½ square inches (967 mm²).

CELL TIER. Levels of *cells* vertically stacked above one another within a *housing unit*.

CEMENT PLASTER. A mixture of Portland or blended cement, Portland cement or blended cement and hydrated lime, masonry cement or plastic cement and aggregate and other *approved* materials as specified in this code.

CERAMIC FIBER BLANKET. A high-temperature *mineral wool* insulation material made of alumina-silica ceramic or calcium magnesium silicate soluble fibers and weighing 4 to 10 pounds per cubic foot (pcf) (64 to 160 kg/m³).

CERTIFICATE OF COMPLIANCE. A certificate stating that materials and products meet specified standards or that work was done in compliance with *approved construction documents*.

CHANGE OF OCCUPANCY. A change in the purpose or level of activity within a building that involves a change in application of the requirements of this code.

CHIMNEY. A primarily vertical structure containing one or more flues, for the purpose of carrying gaseous products of combustion and air from a fuel-burning appliance to the outdoor atmosphere.

Factory-built chimney. A *listed* and *labeled* chimney composed of factory-made components, assembled in the field in accordance with manufacturer's instructions and the conditions of the listing.

Masonry chimney. A field-constructed chimney composed of solid masonry units, bricks, stones, or concrete.

Metal chimney. A field-constructed chimney of metal.

CHIMNEY TYPES.

High-heat appliance type. An *approved* chimney for removing the products of combustion from fuel-burning, high-heat appliances producing combustion gases in excess of 2000°F (1093°C) measured at the appliance flue outlet (see Section 2113.11.3).

Low-heat appliance type. An *approved* chimney for removing the products of combustion from fuel-burning, low-heat appliances producing combustion gases not in excess of 1000°F (538°C) under normal operating conditions, but capable of producing combustion gases of 1400°F (760°C) during intermittent forces firing for periods up to 1 hour. Temperatures shall be measured at the appliance flue outlet.

Masonry type. A field-constructed chimney of solid masonry units or stones.

Medium-heat appliance type. An *approved* chimney for removing the products of combustion from fuel-burning, medium-heat appliances producing combustion gases not exceeding 2000°F (1093°C) measured at the appliance flue outlet (see Section 2113.11.2).

CIRCULATION PATH. An exterior or interior way of passage from one place to another for pedestrians.

CLEAN AGENT. Electrically nonconducting, volatile or gaseous fire extinguishant that does not leave a residue upon vaporation.

CLIMATE ZONE. A geographical region that has been assigned climatic criteria as specified in Chapters 3CE and 3RE of the *Energy Conservation Code*.

CLINIC, OUTPATIENT. Buildings or portions thereof used to provide *medical care* on less than a 24-hour basis to persons who are not rendered *incapable of self-preservation* by the services provided.

CLOSED SYSTEM. The use of a *solid* or *liquid hazardous material* involving a closed vessel or system that remains closed during normal operations where vapors emitted by the product are not liberated outside of the vessel or system and the product is not exposed to the atmosphere during normal operations; and all *uses of compressed gases*. Examples of closed systems for *solids* and *liquids* include product conveyed through a piping system into a closed vessel, system or piece of equipment.

COASTAL A ZONE. Area within a *special flood hazard area*, landward of a V zone or landward of an open coast without mapped *coastal high hazard areas*. In a coastal A zone, the principal source of flooding must be astronomical tides, storm surges, seiches or tsunamis, not riverine flooding. During the base flood conditions, the potential for breaking wave height shall be greater than or equal to 1½ feet (457 mm). The inland limit of the coastal A zone is (a) the Limit of Moderate Wave Action if delineated on a FIRM, or (b) designated by the authority having jurisdiction.

COASTAL HIGH HAZARD AREA. Area within the *special flood hazard area* extending from offshore to the inland limit of a primary dune along an open coast and any other area that is subject to high-velocity wave action from storms or seismic sources, and shown on a Flood Insurance Rate Map (FIRM) or other flood hazard map as velocity Zone V, VO, VE or V1-30.

COLLAR JOINT. Vertical longitudinal space between wythes of masonry or between masonry wythe and backup construction that is permitted to be filled with mortar or grout.

COLLECTOR. A horizontal *diaphragm* element parallel and in line with the applied force that collects and transfers *diaphragm* shear forces to the vertical elements of the lateral force-resisting system or distributes forces within the *diaphragm*, or both.

COMBINATION FIRE/SMOKE DAMPER. A *listed* device installed in ducts and air transfer openings designed to close *automatically* upon the detection of heat and resist the passage of flame and smoke. The device is installed to operate *automatically*, controlled by a smoke detection system, and where required, is capable of being positioned from a *fire command center*.

COMBUSTIBLE DUST. Finely divided *solid* material that is 420 microns or less in diameter and which, when dispersed in air in the proper proportions, could be ignited by a flame, spark or other source of ignition. Combustible dust will pass through a U.S. No. 40 standard sieve.

COMBUSTIBLE FIBERS. Readily ignitable and free-burning materials in a fibrous or shredded form, such as cocoa fiber, cloth, cotton, excelsior, hay, hemp, henequen, istle, jute, kapok, oakum, rags, sisal, Spanish moss, straw, tow, wastepaper, certain synthetic fibers or other like materials. This definition does not include densely packed baled cotton.

COMBUSTIBLE LIQUID. A *liquid* having a closed cup *flash point* at or above 100°F (38°C). Combustible liquids shall be subdivided as follows:

Class II. *Liquids* having a closed cup *flash point* at or above 100°F (38°C) and below 140°F (60°C).

Class IIIA. *Liquids* having a closed cup *flash point* at or above 140°F (60°C) and below 200°F (93°C).

Class IIIB. *Liquids* having a closed cup *flash point* at or above 200°F (93°C).

The category of combustible liquids does not include *compressed gases* or *cryogenic fluids*.

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COMMERCIAL MOTOR VEHICLE. A motor vehicle used to transport passengers or property where the motor vehicle:

1. Has a gross vehicle weight rating of 10,000 pounds (4540 kg) or more; or
2. Is designed to transport 16 or more passengers, including the driver.

COMMON PATH OF EGRESS TRAVEL. That portion of the *exit access* travel distance measured from the most remote point within a *story* to that point where the occupants have separate and distinct access to two *exits* or *exit access* doorways.

COMMON USE. Interior or exterior *circulation paths*, rooms, spaces or elements that are not for public use and are made available for the shared use of two or more people.

COMPRESSED GAS. A material, or mixture of materials, that:

1. Is a gas at 68°F (20°C) or less at 14.7 pounds per square inch atmosphere (psia) (101 kPa) of pressure; and
2. Has a *boiling point* of 68°F (20°C) or less at 14.7 psia (101 kPa) which is either liquefied, nonliquefied or in solution, except those gases which have no other health- or physical-hazard properties are not considered to be compressed until the pressure in the packaging exceeds 41 psia (282 kPa) at 68°F (20°C).

The states of a compressed gas are categorized as follows:

1. Nonliquefied compressed gases are gases, other than those in solution, which are in a packaging under the charged pressure and are entirely gaseous at a temperature of 68°F (20°C).
2. Liquefied compressed gases are gases that, in a packaging under the charged pressure, are partially *liquid* at a temperature of 68°F (20°C).
3. Compressed gases in solution are nonliquefied gases that are dissolved in a solvent.
4. Compressed gas mixtures consist of a mixture of two or more compressed gases contained in a packaging, the hazard properties of which are represented by the properties of the mixture as a whole.

CONCRETE.

Carbonate aggregate. Concrete made with aggregates consisting mainly of calcium or magnesium carbonate, such as limestone or dolomite, and containing 40 percent or less quartz, chert or flint.

Cellular. A lightweight insulating concrete made by mixing a preformed foam with Portland cement slurry and having a dry unit weight of approximately 30 pcf (480 kg/m³).

Lightweight aggregate. Concrete made with aggregates of expanded clay, shale, slag or slate or sintered fly ash or any natural lightweight aggregate meeting ASTM C330 and possessing equivalent fire-resistance properties and weighing 85 to 115 pcf (1360 to 1840 kg/m³).

Perlite. A lightweight insulating concrete having a dry unit weight of approximately 30 pcf (480 kg/m³) made

with perlite concrete aggregate. Perlite aggregate is produced from a volcanic rock which, when heated, expands to form a glass-like material of cellular structure.

Sand-lightweight. Concrete made with a combination of expanded clay, shale, slag, slate, sintered fly ash, or any natural lightweight aggregate meeting ASTM C330 and possessing equivalent fire-resistance properties and natural sand. Its unit weight is generally between 105 and 120 pcf (1680 and 1920 kg/m³).

Siliceous aggregate. Concrete made with normal-weight aggregates consisting mainly of silica or compounds other than calcium or magnesium carbonate, which contains more than 40-percent quartz, chert or flint.

Vermiculite. A light weight insulating concrete made with vermiculite concrete aggregate which is laminated micaceous material produced by expanding the ore at high temperatures. When added to a Portland cement slurry the resulting concrete has a dry unit weight of approximately 30 pcf (480 kg/m³).

CONGREGATE LIVING FACILITIES. A building or part thereof that contains *sleeping units* where residents share bathroom or kitchen facilities, or both.

CONSTANTLY ATTENDED LOCATION. A designated location at a facility staffed by trained personnel on a continuous basis where alarm or supervisory signals are monitored and facilities are provided for notification of the fire department or other emergency services.

CONSTRUCTION DOCUMENTS. Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building *permit*.

CONSTRUCTION TYPES. See Section 602.

Type I. See Section 602.2.

Type II. See Section 602.2.

Type III. See Section 602.3.

Type IV. See Section 602.4.

Type V. See Section 602.5.

CONTINUOUS GAS DETECTION SYSTEM. A gas detection system where the analytical instrument is maintained in continuous operation and sampling is performed without interruption. Analysis is allowed to be performed on a cyclical basis at intervals not to exceed 30 minutes.

CONTROL AREA. Spaces within a building where quantities of *hazardous materials* not exceeding the maximum allowable quantities per control area are stored, dispensed, *used* or handled. See the definition of "Outdoor control area" in the *Fire Code*.

CONTROLLED LOW-STRENGTH MATERIAL. A self-compacted, cementitious material used primarily as a backfill in place of compacted fill.

CONVENTIONAL LIGHT-FRAME CONSTRUCTION. A type of construction whose primary structural elements are formed by a system of repetitive wood-framing

members. See Section 2308 for conventional light-frame construction provisions.

CORNICE. A projecting horizontal molded element located at or near the top of an architectural feature.

CORRIDOR. An enclosed *exit access* component that defines and provides a path of egress travel.

CORRIDOR, OPEN-ENDED. See “Open-ended corridor.”

CORRIDOR DAMPER. A *listed* device intended for use where air ducts penetrate or terminate at horizontal openings in the ceilings of fire-resistance-rated corridors, where the corridor ceiling is permitted to be constructed as required for the corridor walls.

CORROSION RESISTANCE. The ability of a material to withstand deterioration of its surface or its properties when exposed to its environment.

CORROSIVE. A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the point of contact. A chemical shall be considered corrosive if, when tested on the intact skin of albino rabbits by the method described in DOTn 49 CFR, Part 173.137, such chemical destroys or changes irreversibly the structure of the tissue at the point of contact following an exposure period of 4 hours. This term does not refer to action on inanimate surfaces.

COURT. An open, uncovered space, unobstructed to the sky, bounded on three or more sides by exterior building walls or other enclosing devices.

COVERED MALL BUILDING. A single building enclosing a number of tenants and occupants, such as retail stores, drinking and dining establishments, entertainment and amusement facilities, passenger transportation terminals, offices and other similar uses wherein two or more tenants have a main entrance into one or more malls. *Anchor buildings* shall not be considered as a part of the covered mall building. The term “covered mall building” shall include *open mall buildings* as defined below.

Mall. A roofed or covered common pedestrian area within a *covered mall building* that serves as access for two or more tenants and not to exceed three levels that are open to each other. The term “mall” shall include open malls as defined below.

Open mall. An unroofed common pedestrian way serving a number of tenants not exceeding three levels. Circulation at levels above grade shall be permitted to include open exterior balconies leading to *exits* discharging at grade.

Open mall building. Several structures housing a number of tenants, such as retail stores, drinking and dining establishments, entertainment and amusement facilities, offices, and other similar uses, wherein two or more tenants have a main entrance into one or more open malls. *Anchor buildings* are not considered as a part of the open mall building.

CRIPPLE WALL. A framed stud wall extending from the top of the foundation to the underside of floor framing for the lowest occupied floor level.

CRITICAL CIRCUIT. A circuit that requires continuous operation to ensure safety of the structure and occupants.

CROSS-LAMINATED TIMBER. A prefabricated engineered wood product consisting of not less than three layers of solid-sawn lumber or *structural composite lumber* where the adjacent layers are cross oriented and bonded with structural adhesive to form a solid wood element.

CRYOGENIC FLUID. A *liquid* having a *boiling point* lower than -150°F (-101°C) at 14.7 pounds per square inch atmosphere (psia) (an absolute pressure of 101 kPa).

CUSTODIAL CARE. Assistance with day-to-day living tasks; such as assistance with cooking, taking medication, bathing, using toilet facilities and other tasks of daily living. Custodial care includes persons receiving care who have the ability to respond to emergency situations and evacuate at a slower rate and/or who have mental and psychiatric complications.

DALLE GLASS. A decorative composite glazing material made of individual pieces of glass that are embedded in a cast matrix of concrete or epoxy.

DAMPER. See “Ceiling radiation damper,” “Combination fire/smoke damper,” “Corridor damper,” “Fire damper” and “Smoke damper.”

DANGEROUS. Any building, structure or portion thereof that meets any of the conditions described below shall be deemed dangerous:

1. The building or structure has collapsed, has partially collapsed, has moved off its foundation or lacks the necessary support of the ground.
2. There exists a significant risk of collapse, detachment or dislodgment of any portion, member, appurtenance or ornamentation of the building or structure under service loads.

DAY BOX. A portable magazine designed to hold explosive materials constructed in accordance with the requirements for a Type 3 magazine as defined and classified in Chapter 56 of the *Fire Code*.

DEAD LOAD. The weight of materials of construction incorporated into the building, including but not limited to walls, floors, roofs, ceilings, *stairways*, built-in partitions, finishes, cladding and other similarly incorporated architectural and structural items, and the weight of fixed service equipment, such as cranes, plumbing stacks and risers, electrical feeders, heating, ventilating and air-conditioning systems and *automatic sprinkler systems*.

DECORATIVE GLASS. A carved, leaded or *Dalle glass* or glazing material whose purpose is decorative or artistic, not functional; whose coloring, texture or other design qualities or components cannot be removed without destroying the glazing material and whose surface, or assembly into which it is incorporated, is divided into segments.

DECORATIVE MATERIALS. All materials applied over the building *interior finish* for decorative, acoustical or other effect including, but not limited to, curtains, draperies, fabrics and streamers; and all other materials utilized for decorative effect including, but not limited to, bulletin boards, artwork, posters, photographs, batting, cloth, cotton, hay, stalks, straw, vines, leaves, trees, moss and similar items, foam plastics and materials containing foam plastics. Decorative materials do

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not include wall coverings, ceiling coverings, floor coverings, ordinary window shades, *interior finish* and materials 0.025 inch (0.64 mm) or less in thickness applied directly to and adhering tightly to a substrate.

DEEP FOUNDATION. A deep foundation is a foundation element that does not satisfy the definition of a *shallow foundation*.

DEFEND-IN-PLACE. A method of emergency response that engages building components and trained staff to provide occupant safety during an emergency. Emergency response involves remaining in place, relocating within the building, or both, without evacuating the building.

DEFERRED SUBMITTAL. Those portions of the design that are not submitted at the time of the application and that are to be submitted to the *building official* within a specified period.

DEFLAGRATION. An exothermic reaction, such as the extremely rapid oxidation of a flammable dust or vapor in air, in which the reaction progresses through the unburned material at a rate less than the velocity of sound. A deflagration can have an explosive effect.

DELUGE SYSTEM. A sprinkler system employing open sprinklers attached to a piping system connected to a water supply through a valve that is opened by the operation of a detection system installed in the same areas as the sprinklers. When this valve opens, water flows into the piping system and discharges from all sprinklers attached thereto.

DESIGN DISPLACEMENT. See Section 1905.1.1.

DESIGN EARTHQUAKE GROUND MOTION. The earthquake ground motion that buildings and structures are specifically proportioned to resist in Section 1613.

DESIGN FLOOD. The *flood* associated with the greater of the following two areas:

1. Area with a flood plain subject to a 1-percent or greater chance of *flooding* in any year.
2. Area designated as a *flood hazard area* on a community's flood hazard map, or otherwise legally designated.

DESIGN FLOOD ELEVATION. The elevation of the "*design flood*," including wave height, relative to the datum specified on the District of Columbia's legally designated flood hazard map.

DESIGN PROFESSIONAL, REGISTERED. See "Registered design professional."

DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE, REGISTERED. See "Registered design professional in responsible charge."

DESIGN STRENGTH. The product of the nominal strength and a *resistance factor* (or strength reduction factor).

DESIGNATED SEISMIC SYSTEM. Those nonstructural components that require design in accordance with Chapter 13 of ASCE 7 and for which the component importance factor, I_p , is greater than 1 in accordance with Section 13.1.3 of ASCE 7.

DETACHED BUILDING. A separate single-story building, without a basement or crawl space, used for the storage or use of *hazardous materials* and located an *approved* distance from all structures.

DETAILED PLAIN CONCRETE STRUCTURAL WALL. See Section 1905.1.1

DETECTABLE WARNING. A standardized surface feature built in or applied to walking surfaces or other elements to warn visually impaired persons of hazards on a *circulation path*.

DETECTOR, HEAT. A fire detector that senses heat—either abnormally high temperature or rate of rise, or both.

DETONATION. An exothermic reaction characterized by the presence of a shock wave in the material which establishes and maintains the reaction. The reaction zone progresses through the material at a rate greater than the velocity of sound. The principal heating mechanism is one of shock compression. Detonations have an explosive effect.

DETOXIFICATION FACILITIES. Facilities that provide treatment for substance abuse, serving care recipients who are *incapable of self-preservation* or who are harmful to themselves or others.

DIAPHRAGM. A horizontal or sloped system acting to transmit lateral forces to vertical elements of the lateral force-resisting system. When the term "diaphragm" is used, it shall include horizontal bracing systems.

Diaphragm, blocked. In *light-frame construction*, a diaphragm in which all sheathing edges not occurring on a framing member are supported on and fastened to blocking.

Diaphragm boundary. In *light-frame construction*, a location where shear is transferred into or out of the diaphragm sheathing. Transfer is either to a boundary element or to another force-resisting element.

Diaphragm chord. A diaphragm boundary element perpendicular to the applied load that is assumed to take axial stresses due to the diaphragm moment.

Diaphragm, unblocked. A diaphragm that has edge nailing at supporting members only. Blocking between supporting structural members at panel edges is not included. Diaphragm panels are field nailed to supporting members.

DIMENSIONS (for Chapter 21).

Nominal. The *specified dimension* plus an allowance for the *joints* with which the units are to be laid. Nominal dimensions are usually stated in whole numbers. Thickness is given first, followed by height and then length.

Specified. Dimensions specified for the manufacture or construction of a unit, *joint* or element.

DIRECT ACCESS. A path of travel from a space to an immediately adjacent space through an opening in the common wall between the two spaces.

DISPENSING. The pouring or transferring of any material from a container, tank or similar vessel, whereby vapors, dusts, fumes, mists or gases are liberated to the atmosphere.

DOOR, BALANCED. See “Balanced door.”

DOOR, LOW-ENERGY POWER-OPERATED. See “Low-energy power-operated door.”

DOOR, POWER-ASSISTED. See “Power-assisted door.”

DOOR, POWER-OPERATED. See “Power-operated door.”

DOORWAY, EXIT ACCESS. See “Exit access doorway.”

DORMITORY. A space in a building where group sleeping accommodations are provided in one room, or in a series of closely associated rooms, for persons not members of the same family group, under joint occupancy and single management, as in college dormitories or fraternity houses.

DRAFTSTOP. A material, device or construction installed to restrict the movement of air within open spaces of concealed areas of building components such as crawl spaces, floor/ceiling assemblies, roof/ceiling assemblies and *attics*.

DRAG STRUT. See “Collector.”

DRILLED SHAFT. A cast-in-place deep foundation element constructed by drilling a hole (with or without permanent casing) into soil or rock and filling it with fluid concrete.

Socketed drilled shaft. A drilled shaft with a permanent pipe or tube casing that extends down to bedrock and an uncased socket drilled into the bedrock.

DRY-CHEMICAL EXTINGUISHING AGENT. A powder composed of small particles, usually of sodium bicarbonate, potassium bicarbonate, urea-potassium-based bicarbonate, potassium chloride or monoammonium phosphate, with added particulate material supplemented by special treatment to provide resistance to packing, resistance to moisture absorption (caking) and the proper flow capabilities.

DRY FLOODPROOFING. A combination of design modifications that results in a building or structure, including the attendant utilities and equipment and sanitary facilities, being water tight with walls substantially impermeable to the passage of water and with structural components having the capacity to resist *loads* as identified in ASCE 7.

DWELLING. A building that contains one or two *dwelling units* used, intended or designed to be used, rented, leased, let or hired out to be occupied for living purposes.

DWELLING UNIT. A single unit providing complete, independent living facilities for one or more persons, including

permanent provisions for living, sleeping, eating, cooking and sanitation.

DWELLING UNIT OR SLEEPING UNIT, MULTI-STORY. See “Multistory unit.”

EGRESS COURT. A *court* or *yard* which provides access to a *public way* for one or more *exits*.

ELECTRICAL CIRCUIT PROTECTIVE SYSTEM. A specific construction of devices, materials, or coatings installed as a fire-resistive barrier system applied to electrical system components, such as cable trays, conduits and other raceways, open run cables and conductors, cables, and conductors.

ELEVATOR GROUP. A grouping of elevators in a building located adjacent or directly across from one another that responds to common hall call buttons.

EMERGENCY ALARM SYSTEM. A system to provide indication and warning of emergency situations involving *hazardous materials*.

EMERGENCY CONTROL STATION. An *approved* location on the premises where signals from emergency equipment are received and which is staffed by trained personnel.

EMERGENCY ESCAPE AND RESCUE OPENING. An operable window, door or other similar device that provides for a means of escape and access for rescue in the event of an emergency.

EMERGENCY VOICE/ALARM COMMUNICATIONS. Dedicated manual or *automatic* facilities for originating and distributing voice instructions, as well as alert and evacuation signals pertaining to a fire emergency, to the occupants of a building.

EMERGENCY POWER SYSTEM. A source of automatic electric power of a required capacity and duration to operate required life safety, fire alarm, detection and ventilation systems in the event of a failure of the primary power. Emergency power systems are required for electrical loads where interruption of the primary power could result in loss of human life or serious injuries.

EMPLOYEE WORK AREA. All or any portion of a space used only by employees and only for work. *Corridors*, toilet rooms, kitchenettes and break rooms are not employee work areas.

ENGINEERED WOOD RIM BOARD. A full-depth structural composite lumber, wood structural panel, structural glued laminated timber or prefabricated wood I-joist member designed to transfer horizontal (shear) and vertical (compression) loads, provide attachment for diaphragm sheathing, siding and exterior deck ledgers, and provide lateral support at the ends of floor or roof joists or rafters.

ENTRANCE, PUBLIC. See “Public entrance.”

ENTRANCE, RESTRICTED. See “Restricted entrance.”

ENTRANCE, SERVICE. See “Service entrance.”

EQUIPMENT PLATFORM. An unoccupied, elevated platform used exclusively for mechanical systems or industrial process equipment, including the associated elevated walk-

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ways, stairways, alternating tread devices and ladders necessary to access the platform (see Section 505.3).

ESSENTIAL FACILITIES. Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from *flood*, wind, snow or earthquakes.

EXHAUSTED ENCLOSURE. An appliance or piece of equipment that consists of a top, a back and two sides providing a means of local exhaust for capturing gases, fumes, vapors and mists. Such enclosures include laboratory hoods, exhaust fume hoods and similar appliances and equipment used to locally retain and exhaust the gases, fumes, vapors and mists that could be released. Rooms or areas provided with general *ventilation*, in themselves, are not exhausted enclosures.

EXISTING STRUCTURE. Any *structure* that has been erected and legally occupied (excluding *structures* occupied pursuant to a temporary certificate of occupancy).

EXIT. That portion of a *means of egress* system between the *exit access* and the *exit discharge* or *public way*. Exit components include exterior exit doors at the *level of exit discharge*, *interior exit stairways* and *ramps*, *exit passageways*, *exterior exit stairways* and *ramps* and *horizontal exits*.

EXIT ACCESS. That portion of a *means of egress* system that leads from any occupied portion of a building or structure to an *exit*.

EXIT ACCESS DOORWAY. A door or access point along the path of egress travel from an occupied room, area or space where the path of egress enters an intervening room, *corridor*, *exit access stairway* or *ramp*.

EXIT ACCESS RAMP. A *ramp* within the exit access portion of the means of egress system.

EXIT ACCESS STAIRWAY. A *stairway* with the exit access portion of the means of egress system.

EXIT DISCHARGE. That portion of a *means of egress* system between the termination of an *exit* and a *public way*.

EXIT DISCHARGE, LEVEL OF. The *story* at the point at which an *exit* terminates and an *exit discharge* begins.

EXIT, HORIZONTAL. See “Horizontal exit.”

EXIT PASSAGEWAY. An *exit* component that is separated from other interior spaces of a building or structure by fire-resistance-rated construction and opening protectives, and provides for a protected path of egress travel in a horizontal direction to an *exit* or to the *exit discharge*.

EXPANDED VINYL WALL COVERING. Wall covering consisting of a woven textile backing, an expanded vinyl base coat layer and a nonexpanded vinyl skin coat. The expanded base coat layer is a homogeneous vinyl layer that contains a blowing agent. During processing, the blowing agent decomposes, causing this layer to expand by forming closed cells. The total thickness of the wall covering is approximately 0.055 inch to 0.070 inch (1.4 mm to 1.78 mm).

EXPLOSION. An effect produced by the sudden violent expansion of gases, which may be accompanied by a shock

wave or disruption, or both, of enclosing materials or structures. An explosion could result from any of the following:

1. Chemical changes such as rapid oxidation, *deflagration* or *detonation*, decomposition of molecules and runaway polymerization (usually *detonations*).
2. Physical changes such as pressure tank ruptures.
3. Atomic changes (nuclear fission or fusion).

EXPLOSIVE. A chemical compound, mixture or device, the primary or common purpose of which is to function by explosion. The term includes, but is not limited to, dynamite, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord, igniters and display fireworks, 1.3G.

The term “explosive” includes any material determined to be within the scope of USC Title 18: Chapter 40 and also includes any material classified as an explosive other than consumer fireworks, 1.4G by the *hazardous materials* regulations of DOTn 49 CFR Parts 100-185.

High explosive. Explosive material, such as dynamite, which can be caused to detonate by means of a No. 8 test blasting cap when unconfined.

Low explosive. Explosive material that will burn or deflagrate when ignited. It is characterized by a rate of reaction that is less than the speed of sound. Examples of low explosives include, but are not limited to, black powder; safety fuse; igniters; igniter cord; fuse lighters; fireworks, 1.3G and propellants, 1.3C.

Mass-detonating explosives. Division 1.1, 1.2 and 1.5 explosives alone or in combination, or loaded into various types of ammunition or containers, most of which can be expected to explode virtually instantaneously when a small portion is subjected to fire, severe concussion, impact, the impulse of an initiating agent or the effect of a considerable discharge of energy from without. Materials that react in this manner represent a mass explosion hazard. Such an explosive will normally cause severe structural damage to adjacent objects. Explosive propagation could occur immediately to other items of ammunition and explosives stored sufficiently close to and not adequately protected from the initially exploding pile with a time interval short enough so that two or more quantities must be considered as one for quantity-distance purposes.

UN/DOTn Class 1 explosives. The former classification system used by DOTn included the terms “high” and “low” explosives as defined herein. The following terms further define explosives under the current system applied by DOTn for all explosive materials defined as hazard Class 1 materials. Compatibility group letters are used in concert with the division to specify further limitations on each division noted (i.e., the letter G identifies the material as a pyrotechnic substance or article containing a pyrotechnic substance and similar materials).

Division 1.1. Explosives that have a mass explosion hazard. A mass explosion is one which affects almost the entire load instantaneously.

Division 1.2. Explosives that have a projection hazard but not a mass explosion hazard.

Division 1.3. Explosives that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.

Division 1.4. Explosives that pose a minor explosion hazard. The explosive effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package.

Division 1.5. Very insensitive explosives. This division is comprised of substances that have a mass explosion hazard, but that are so insensitive there is very little probability of initiation or of transition from burning to *detonation* under normal conditions of transport.

Division 1.6. Extremely insensitive articles which do not have a mass explosion hazard. This division is comprised of articles that contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.

EXTERIOR EXIT RAMP. An *exit* component that serves to meet one or more *means of egress* design requirements, such as required number of *exits* or *exit access* travel distance, and is open to *yards, courts* or *public ways*.

EXTERIOR EXIT STAIRWAY. An *exit* component that serves to meet one or more *means of egress* design requirements, such as required number of *exits* or *exit access* travel distance, and is open to *yards, courts* or *public ways*.

EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS). EIFS are nonstructural, nonload-bearing, *exterior wall* cladding systems that consist of an insulation board attached either adhesively or mechanically, or both, to the substrate; an integrally reinforced base coat and a textured protective finish coat.

EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) WITH DRAINAGE. An EIFS that incorporates a means of drainage applied over a *water-resistive barrier*.

EXTERIOR SURFACES. Weather-exposed surfaces.

EXTERIOR WALL. A wall, bearing or nonbearing, that is used as an enclosing wall for a building, other than a *fire wall*, and that has a slope of 60 degrees (1.05 rad) or greater with the horizontal plane.

EXTERIOR WALL COVERING. A material or assembly of materials applied on the exterior side of *exterior walls* for the purpose of providing a weather-resisting barrier, insulation or for aesthetics, including but not limited to, *veneers*, siding, *exterior insulation and finish systems*, architectural trim and embellishments such as *cornices*, soffits, facias, gutters and leaders.

EXTERIOR WALL ENVELOPE. A system or assembly of *exterior wall* components, including *exterior wall* finish materials, that provides protection of the building structural members, including framing and sheathing materials, and

conditioned interior space, from the detrimental effects of the exterior environment.

F RATING. The time period that the *through-penetration firestop system* limits the spread of fire through the penetration when tested in accordance with ASTM E814 or UL 1479.

FABRIC PARTITION. A partition consisting of a finished surface made of fabric, without a continuous rigid backing, that is directly attached to a framing system in which the vertical framing members are spaced greater than 4 feet (1219 mm) on center.

FABRICATED ITEM. Structural, load-bearing or lateral load-resisting members of assemblies consisting of materials assembled prior to installation in a building or structure, or subjected to operations such as heat treatment, thermal cutting, cold working or reforming after manufacture and prior to installation in a building or structure. Materials produced in accordance with standards referenced by this code, such as rolled structural steel shapes, steel reinforcing bars, *masonry units* and *wood structural panels*, or in accordance with a referenced standard that provides requirements for quality control done under the supervision of a third-party quality control agency, are not “fabricated items.”

FABRICATION AREA. An area within a semiconductor fabrication facility and related research and development areas in which there are processes using hazardous production materials. Such areas are allowed to include ancillary rooms or areas such as dressing rooms and offices that are directly related to the fabrication area processes.

FACILITY. All or any portion of buildings, structures, *site* improvements, elements and pedestrian or vehicular routes located on a *site*.

FACTORED LOAD. The product of a *nominal load* and a *load factor*.

FENESTRATION. Skylights, roof windows, vertical windows (fixed or moveable), opaque doors, glazed doors, glazed block and combination opaque/glazed doors. Fenestration includes products with glass and nonglass glazing materials.

FIBER-CEMENT (BACKER BOARD, SIDING, SOFFIT, TRIM AND UNDERLAYMENT) PRODUCTS. Manufactured thin section composites of hydraulic cementitious matrices and discrete nonasbestos fibers.

FIBER-REINFORCED POLYMER. A polymeric composite material consisting of reinforcement fibers, such as glass, impregnated with a fiber-binding polymer which is then molded and hardened. Fiber-reinforced polymers are permitted to contain cores laminated between fiber-reinforced polymer facings.

FIBERBOARD. A fibrous, homogeneous panel made from lignocellulosic fibers (usually wood or cane) and having a density of less than 31 pounds per cubic foot (pcf) (497 kg/m³) but more than 10 pcf (160 kg/m³).

FIELD NAILING. See “Nailing, field.”

FIRE ALARM BOX, MANUAL. See “Manual fire alarm box.”

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FIRE ALARM CONTROL UNIT. A system component that receives inputs from *automatic* and manual *fire alarm* devices and may be capable of supplying power to detection devices and transponders or off-premises transmitters. The control unit may be capable of providing a transfer of power to the notification appliances and transfer of condition to relays or devices.

FIRE ALARM SIGNAL. A signal initiated by a *fire alarm-initiating device* such as a *manual fire alarm box*, *automatic fire detector*, waterflow switch or other device whose activation is indicative of the presence of a fire or fire signature.

FIRE ALARM SYSTEM. A system or portion of a combination system consisting of components and circuits arranged to monitor and annunciate the status of *fire alarm* or *supervisory signal-initiating devices* and to initiate the appropriate response to those signals.

FIRE AREA. The aggregate floor area enclosed and bounded by *fire walls*, *fire barriers*, *exterior walls* or *horizontal assemblies* of a building. Areas of the building not provided with surrounding walls shall be included in the fire area if such areas are included within the horizontal projection of the roof or floor next above.

FIRE BARRIER. A fire-resistance-rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained.

FIRE COMMAND CENTER. The principal attended or unattended location where the status of detection, alarm communications and control systems is displayed, and from which the systems can be manually controlled.

FIRE DAMPER. A *listed* device installed in ducts and air transfer openings designed to close *automatically* upon detection of heat and resist the passage of flame. Fire dampers are classified for use in either static systems that will *automatically* shut down in the event of a fire, or in dynamic systems that continue to operate during a fire. A dynamic fire damper is tested and rated for closure under elevated temperature airflow.

FIRE DETECTOR, AUTOMATIC. A device designed to detect the presence of a fire signature and to initiate action.

FIRE DOOR. The door component of a *fire door assembly*.

FIRE DOOR ASSEMBLY. Any combination of a *fire door*, frame, hardware and other accessories that together provide a specific degree of fire protection to the opening.

FIRE DOOR ASSEMBLY, FLOOR. See “Floor fire door assembly.”

FIRE EXIT HARDWARE. *Panic hardware* that is *listed* for use on *fire door assemblies*.

FIRE LANE. A road or other passageway developed to allow the passage of fire apparatus. A fire lane is not necessarily intended for vehicular traffic other than fire apparatus.

FIRE PARTITION. A vertical assembly of materials designed to restrict the spread of fire in which openings are protected.

FIRE PROTECTION RATING. The period of time that an opening protective will maintain the ability to confine a fire

as determined by tests specified in Section 716. Ratings are stated in hours or minutes.

FIRE PROTECTION SYSTEM. *Approved* devices, equipment and systems or combinations of systems used to detect a fire, activate an alarm, extinguish or control a fire, control or manage smoke and products of a fire or any combination thereof.

FIRE-RATED GLAZING. Glazing with either a *fire protection rating* or a *fire-resistance rating*.

FIRE RESISTANCE. That property of materials or their assemblies that prevents or retards the passage of excessive heat, hot gases or flames under conditions of use.

FIRE-RESISTANCE RATING. The period of time a building element, component or assembly maintains the ability to confine a fire, continues to perform a given structural function, or both, as determined by the tests, or the methods based on tests, prescribed in Section 703.

FIRE-RESISTANT JOINT SYSTEM. An assemblage of specific materials or products that are designed, tested and fire-resistance rated in accordance with either ASTM E1966 or UL 2079 to resist for a prescribed period of time the passage of fire through *joints* made in or between fire-resistance-rated assemblies.

FIRE SAFETY FUNCTIONS. Building and fire control functions that are intended to increase the level of life safety for occupants or to control the spread of harmful effects of fire.

FIRE SEPARATION DISTANCE. The distance measured from the building face to one of the following:

1. The closest interior *lot line*.
2. To the centerline of a street, an alley or *public way*.
3. To an imaginary line between two buildings on the lot.

The distance shall be measured at right angles from the face of the wall.

FIRE WALL. A fire-resistance-rated wall having protected openings, which restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall.

FIRE WINDOW ASSEMBLY. A window constructed and glazed to give protection against the passage of fire.

FIREBLOCKING. Building materials, or materials *approved* for use as fireblocking, installed to resist the free passage of flame to other areas of the building through concealed spaces.

FIREPLACE. A hearth and fire chamber or similar prepared place in which a fire may be made and which is built in conjunction with a chimney.

FIREPLACE THROAT. The opening between the top of the firebox and the smoke chamber.

FIRESTOP, MEMBRANE-PENETRATION. See “Membrane-penetration firestop.”

FIRESTOP, PENETRATION. See “Penetration firestop.”

FIRESTOP SYSTEM, THROUGH-PENETRATION. See “Through-penetration firestop system.”

FIREWORKS. Any composition or device for the purpose of producing a visible or audible effect for entertainment purposes by combustion, *deflagration* or *detonation* that meets the definition of 1.4G fireworks or 1.3G fireworks.

Fireworks, 1.3G. Large fireworks devices, which are explosive materials, intended for use in fireworks displays and designed to produce audible or visible effects by combustion, *deflagration* or *detonation*. Such 1.3G fireworks include, but are not limited to, firecrackers containing more than 130 milligrams (2 grains) of explosive composition, aerial shells containing more than 40 grams of pyrotechnic composition, and other display pieces which exceed the limits for classification as 1.4G fireworks. Such 1.3G fireworks are also described as fireworks, UN0335 by the DOTn.

Fireworks, 1.4G. Small fireworks devices containing restricted amounts of pyrotechnic composition designed primarily to produce visible or audible effects by combustion. Such 1.4G fireworks which comply with the construction, chemical composition and labeling regulations of the DOTn for fireworks, UN0336, and the U.S. Consumer Product Safety Commission (CPSC) as set forth in CPSC 16 CFR: Parts 1500 and 1507, are not explosive materials for the purpose of this code.

FIXED BASE OPERATOR (FBO). A commercial business granted the right by the airport sponsor to operate on an airport and provide aeronautical services, such as fueling, hanging, tie-down and parking, aircraft rental, aircraft maintenance and flight instruction.

FIXED SEATING. Furniture or fixture designed and installed for the use of sitting and secured in place including bench-type seats and seats with or without backs or arm rests.

FLAME SPREAD. The propagation of flame over a surface.

FLAME SPREAD INDEX. A comparative measure, expressed as a dimensionless number, derived from visual measurements of the spread of flame versus time for a material tested in accordance with ASTM E84 or UL 723.

FLAMMABLE GAS. A material that is a gas at 68°F (20°C) or less at 14.7 pounds per square inch atmosphere (psia) (101 kPa) of pressure [a material that has a *boiling point* of 68°F (20°C) or less at 14.7 psia (101 kPa)] which:

1. Is ignitable at 14.7 psia (101 kPa) when in a mixture of 13 percent or less by volume with air; or
2. Has a flammable range at 14.7 psia (101 kPa) with air of at least 12 percent, regardless of the lower limit.

The limits specified shall be determined at 14.7 psi (101 kPa) of pressure and a temperature of 68°F (20°C) in accordance with ASTM E681.

FLAMMABLE LIQUEFIED GAS. A liquefied compressed gas which, under a charged pressure, is partially liquid at a temperature of 68°F (20°C) and which is flammable.

FLAMMABLE LIQUID. A *liquid* having a closed cup *flash point* below 100°F (38°C). Flammable liquids are further categorized into a group known as Class I liquids. The Class I category is subdivided as follows:

Class IA. *Liquids* having a *flash point* below 73°F (23°C) and a *boiling point* below 100°F (38°C).

Class IB. *Liquids* having a *flash point* below 73°F (23°C) and a *boiling point* at or above 100°F (38°C).

Class IC. *Liquids* having a *flash point* at or above 73°F (23°C) and below 100°F (38°C). The category of flammable liquids does not include *compressed gases* or *cryogenic fluids*.

FLAMMABLE MATERIAL. A material capable of being readily ignited from common sources of heat or at a temperature of 600°F (316°C) or less.

FLAMMABLE SOLID. A *solid*, other than a blasting agent or *explosive*, that is capable of causing fire through friction, absorption or moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which has an ignition temperature below 212°F (100°C) or which burns so vigorously and persistently when ignited as to create a serious hazard. A chemical shall be considered a flammable *solid* as determined in accordance with the test method of CPSC 16 CFR; Part 1500.44, if it ignites and burns with a self-sustained flame at a rate greater than 0.1 inch (2.5 mm) per second along its major axis.

FLAMMABLE VAPORS OR FUMES. The concentration of flammable constituents in air that exceeds 25 percent of their *lower flammable limit (LFL)*.

FLASH POINT. The minimum temperature in degrees Fahrenheit at which a *liquid* will give off sufficient vapors to form an ignitable mixture with air near the surface or in the container, but will not sustain combustion. The flash point of a *liquid* shall be determined by appropriate test procedure and apparatus as specified in ASTM D56, ASTM D93 or ASTM D3278.

FLIGHT. A continuous run of rectangular treads, *winders* or combination thereof from one landing to another.

FLOOD or FLOODING. A general and temporary condition of partial or complete inundation of normally dry land from:

1. The overflow of inland or tidal waters.
2. The unusual and rapid accumulation or runoff of surface waters from any source.

FLOOD DAMAGE-RESISTANT MATERIALS. Any construction material capable of withstanding direct and prolonged contact with floodwaters without sustaining any damage that requires more than cosmetic *repair*.

FLOOD, DESIGN. See “Design flood.”

FLOOD ELEVATION, DESIGN. See “Design flood elevation.”

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

1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any year.

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2. The area designated as a flood hazard area on a community's flood hazard map, or otherwise legally designated.

FLOOD HAZARD AREAS, SPECIAL. See "Special flood hazard area."

FLOOD INSURANCE RATE MAP (FIRM). An official map of a community on which the Federal Emergency Management Agency (FEMA) has delineated both the *special flood hazard areas* and the risk premium zones applicable to the community.

FLOOD INSURANCE STUDY. The official report provided by the Federal Emergency Management Agency containing the Flood Insurance Rate Map (FIRM), the Flood Boundary and Floodway Map (FBFM), the water surface elevation of the *base flood* and supporting technical data.

FLOODWAY. The channel of the river, creek or other watercourse and the adjacent land areas that must be reserved in order to discharge the *base flood* without cumulatively increasing the water surface elevation more than a designated height.

FLOOR AREA, GROSS. The floor area within the inside perimeter of the *exterior walls* of the building under consideration, exclusive of vent *shafts* and *courts*, without deduction for *corridors*, *stairways*, *ramps*, closets, the thickness of interior walls, columns or other features. The floor area of a building, or portion thereof, not provided with surrounding *exterior walls* shall be the usable area under the horizontal projection of the roof or floor above. The gross floor area shall not include *shafts* with no openings or interior *courts*.

FLOOR AREA, NET. The actual occupied area not including unoccupied accessory areas such as *corridors*, *stairways*, *ramps*, toilet rooms, mechanical rooms and closets.

FLOOR FIRE DOOR ASSEMBLY. A combination of a *fire door*, a frame, hardware and other accessories installed in a horizontal plane, which together provide a specific degree of fire protection to a through-opening in a fire-resistance-rated floor (see Section 712.1.13.1).

FOAM-EXTINGUISHING SYSTEM. A special system discharging a foam made from concentrates, either mechanically or chemically, over the area to be protected.

FOAM PLASTIC INSULATION. A plastic that is intentionally expanded by the use of a foaming agent to produce a reduced-density plastic containing voids consisting of open or closed cells distributed throughout the plastic for thermal insulating or acoustical purposes and that has a density less than 20 pounds per cubic foot (pcf) (320 kg/m³).

FOLDING AND TELESCOPIC SEATING. Tiered seating having an overall shape and size that is capable of being reduced for purposes of moving or storing and is not a building element.

FOOD COURT. A public seating area located in the *mall* that serves adjacent food preparation tenant spaces.

FOSTER CARE FACILITIES. Facilities that provide care to more than five children, 2½ years of age or less.

FOUNDATION PIER (for Chapter 21). An isolated vertical foundation member whose horizontal dimension mea-

sured at right angles to its thickness does not exceed three times its thickness and whose height is equal to or less than four times its thickness.

FRAME STRUCTURE. A building or other structure in which vertical *loads* from floors and roofs are primarily supported by columns.

GABLE. The triangular portion of a wall beneath the end of a dual-slope, pitched, or mono-slope roof or portion thereof and above the top plates of the story or level of the ceiling below.

GAS CABINET. A fully enclosed, ventilated noncombustible enclosure used to provide an isolated environment for *compressed gas* cylinders in storage or *use*. Doors and access ports for exchanging cylinders and accessing pressure-regulating controls are allowed to be included.

GAS ROOM. A separately ventilated, fully enclosed room in which only *compressed gases* and associated equipment and supplies are stored or *used*.

GASEOUS HYDROGEN SYSTEM. An assembly of piping, devices and apparatus designed to generate, store, contain, distribute or transport a nontoxic, gaseous hydrogen-containing mixture having not less than 95-percent hydrogen gas by volume and not more than 1-percent oxygen by volume. Gaseous hydrogen systems consist of items such as *compressed gas* containers, reactors and appurtenances, including pressure regulators, pressure relief devices, manifolds, pumps, compressors and interconnecting piping and tubing and controls.

GLASS FIBERBOARD. Fibrous glass roof insulation consisting of inorganic glass fibers formed into rigid boards using a binder. The board has a top surface faced with asphalt and kraft reinforced with glass fiber.

GRADE (LUMBER). The classification of lumber in regard to strength and utility in accordance with American Softwood Lumber Standard DOC PS 20 and the grading rules of an *approved* lumber rules-writing agency.

GRADE PLANE. A reference plane representing the average of finished ground level adjoining the building at *exterior walls*. Where the finished ground level slopes away from the *exterior walls*, the reference plane shall be established by the lowest points within the area between the building and the *lot line* or, where the *lot line* is more than 6 feet (1829 mm) from the building, between the building and a point 6 feet (1829 mm) from the building.

GRADE PLANE, STORY ABOVE. See "Story above grade plane."

GRANDSTAND. Tiered seating supported on a dedicated structural system and two or more rows high and is not a building element (see "*Bleachers*").

GROSS LEASABLE AREA. The total floor area designed for tenant occupancy and exclusive use. The area of tenant occupancy is measured from the centerlines of joint partitions to the outside of the tenant walls. All tenant areas, including areas used for storage, shall be included in calculating gross leasable area.

GROUP HOME. A facility for social rehabilitation, substance abuse or mental health problems that contains a group housing arrangement that provides *custodial care* but does not provide medical care.

GUARD. A building component or a system of building components located at or near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to a lower level.

GUEST ROOM. A room used or intended to be used by one or more guests for living or sleeping purposes.

GYPSUM BOARD. The generic name for a family of sheet products consisting of a noncombustible core primarily of gypsum with paper surfacing. Gypsum wallboard, gypsum sheathing, gypsum base for gypsum veneer plaster, exterior gypsum soffit board, predecorated gypsum board and water-resistant gypsum backing board complying with the standards listed in Tables 2506.2, 2507.2 and Chapter 35 are types of gypsum board.

GYPSUM PANEL PRODUCT. The general name for a family of sheet products consisting essentially of gypsum.

GYPSUM PLASTER. A mixture of calcined gypsum or calcined gypsum and lime and aggregate and other *approved* materials as specified in this code.

GYPSUM VENEER PLASTER. *Gypsum plaster* applied to an *approved* base in one or more coats normally not exceeding $\frac{1}{4}$ inch (6.4 mm) in total thickness.

HABITABLE SPACE. A space in a building for living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces.

HALOGENATED EXTINGUISHING SYSTEM. A fire-extinguishing system using one or more atoms of an element from the halogen chemical series: fluorine, chlorine, bromine and iodine.

HANDLING. The deliberate transport by any means to a point of storage or *use*.

HANDRAIL. A horizontal or sloping rail intended for grasping by the hand for guidance or support.

HARDBOARD. A fibrous-felted, homogeneous panel made from lignocellulosic fibers consolidated under heat and pressure in a hot press to a density not less than 31 pcf (497 kg/m³).

HARDWARE. See “Fire exit hardware” and “Panic hardware.”

HAZARDOUS MATERIALS. Those chemicals or substances that are *physical hazards* or *health hazards* as classified in Section 307 and the *Fire Code*, whether the materials are in usable or waste condition.

HAZARDOUS PRODUCTION MATERIAL (HPM). A *solid*, *liquid* or gas associated with semiconductor manufacturing that has a degree-of-hazard rating in health, flammability or instability of Class 3 or 4 as ranked by NFPA 704 and which is *used* directly in research, laboratory or production processes which have as their end product materials that are not hazardous.

HEAD JOINT. Vertical *mortar joint* placed between *masonry units* within the *wythe* at the time the *masonry units* are laid.

HEALTH HAZARD. A classification of a chemical for which there is statistically significant evidence that acute or chronic health effects are capable of occurring in exposed persons. The term “health hazard” includes chemicals that are *toxic* or *highly toxic*, and *corrosive*.

HEAT DETECTOR. See “Detector, heat.”

HEIGHT, BUILDING. The vertical distance from *grade plane* to the average height of the highest roof surface.

HELICAL PILE. Manufactured steel deep foundation element consisting of a central shaft and one or more helical bearing plates. A helical pile is installed by rotating it into the ground. Each helical bearing plate is formed into a screw thread with a uniform defined pitch.

HELIPAD. A structural surface that is used for the landing, taking off, taxiing and parking of helicopters.

HELIPORT. An area of land or water or a structural surface that is used, or intended for use, for the landing and taking off of helicopters, and any appurtenant areas that are used, or intended for use, for heliport buildings or other heliport facilities.

HELISTOP. The same as “heliport,” except that no fueling, defueling, maintenance, repairs or storage of helicopters is permitted.

HIGH-PRESSURE DECORATIVE EXTERIOR-GRADE COMPACT LAMINATE (HPL). Panels consisting of layers of cellulose fibrous material impregnated with thermosetting resins and bonded together by a high-pressure process to form a homogeneous nonporous core suitable for exterior use.

HIGH-PRESSURE DECORATIVE EXTERIOR-GRADE COMPACT LAMINATE (HPL) SYSTEM. An *exterior wall covering* fabricated using HPL in a specific assembly including *joints*, seams, attachments, substrate, framing and other details as appropriate to a particular design.

HIGH-RISE BUILDING. A building with an occupied floor located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access.

HIGHLY TOXIC. A material which produces a lethal dose or lethal concentration that falls within any of the following categories:

1. A chemical that has a median lethal dose (LD₅₀) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
2. A chemical that has a median lethal dose (LD₅₀) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kilograms each.
3. A chemical that has a median lethal concentration (LC₅₀) in air of 200 parts per million by volume or less

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of gas or vapor, or 2 milligrams per liter or less of mist, fume or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

Mixtures of these materials with ordinary materials, such as water, might not warrant classification as *highly toxic*. While this system is basically simple in application, any hazard evaluation that is required for the precise categorization of this type of material shall be performed by experienced, technically competent persons.

HISTORIC BUILDINGS. Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law.

HORIZONTAL ASSEMBLY. A fire-resistance-rated floor or *roof assembly* of materials designed to restrict the spread of fire in which continuity is maintained.

HORIZONTAL EXIT. An *exit* component consisting of fire-resistance-rated construction and opening protectives intended to compartmentalize portions of a building thereby creating refuge areas that afford safety from the fire and smoke from the area of fire origin.

HOSPITALS AND PSYCHIATRIC HOSPITALS. Facilities that provide care or treatment for the medical, psychiatric, obstetrical, or surgical treatment of care recipients who are *incapable of self-preservation*.

HOUSING UNIT. A *dormitory* or a group of *cells* with a common dayroom in Group I-3.

HPM ROOM. A room used in conjunction with or serving a Group H-5 occupancy, where *HPM* is stored or *used* and which is classified as a Group H-2, H-3 or H-4 occupancy.

HURRICANE-PRONE REGIONS. Areas vulnerable to hurricanes defined as:

1. The U. S. Atlantic Ocean and Gulf of Mexico coasts where the ultimate design wind speed, V_{ult} , for Risk Category II buildings is greater than 115 mph (51.4 m/s);
2. Hawaii, Puerto Rico, Guam, Virgin Islands and American Samoa.

HYDROGEN FUEL GAS ROOM. A room or space that is intended exclusively to house a *gaseous hydrogen system*.

ICE-SENSITIVE STRUCTURE. A structure for which the effect of an atmospheric ice *load* governs the design of a structure or portion thereof. This includes, but is not limited to, lattice structures, guyed masts, overhead lines, light suspension and cable-stayed bridges, aerial cable systems (e.g., for ski lifts or logging operations), amusement rides, open catwalks and platforms, flagpoles and signs.

IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH). The concentration of air-borne contaminants which poses a threat of death, immediate or delayed permanent adverse health effects, or effects that could prevent escape from such an environment. This contaminant concentration level is established by the National Institute of Occupational Safety and Health (NIOSH) based on both toxicity and flammability. It generally is expressed in parts per million by volume (ppmv/v) or milligrams per cubic meter (mg/m³). If adequate data do not exist for precise establish-

ment of IDLH concentrations, an independent certified industrial hygienist, industrial toxicologist, appropriate regulatory agency or other source *approved* by the *building official* shall make such determination.

IMPACT LOAD. The *load* resulting from moving machinery, elevators, craneways, vehicles and other similar forces and kinetic *loads*, pressure and possible surcharge from fixed or moving *loads*.

INCAPABLE OF SELF-PRESERVATION. Persons who, because of age, physical limitations, mental limitations, chemical dependency or medical treatment, cannot respond as an individual to an emergency situation.

INCOMPATIBLE MATERIALS. Materials that, when mixed, have the potential to react in a manner that generates heat, fumes, gases or byproducts which are hazardous to life or property.

INERT GAS. A gas that is capable of reacting with other materials only under abnormal conditions such as high temperatures, pressures and similar extrinsic physical forces. Within the context of the code, inert gases do not exhibit either physical or health hazard properties as defined (other than acting as a simple asphyxiant) or hazard properties other than those of a *compressed gas*. Some of the more common inert gases include argon, helium, krypton, neon, nitrogen and xenon.

INITIATING DEVICE. A system component that originates transmission of a change-of-state condition, such as in a *smoke detector*, *manual fire alarm box* or supervisory switch.

INTENDED TO BE OCCUPIED AS A RESIDENCE. This refers to a *dwelling unit* or *sleeping unit* that can or will be used all or part of the time as the occupant's place of abode.

INTERIOR EXIT RAMP. An *exit* component that serves to meet one or more *means of egress* design requirements, such as required number of *exits* or *exit access* travel distance, and provides for a protected path of egress travel to the *exit discharge* or *public way*.

INTERIOR EXIT STAIRWAY. An *exit* component that serves to meet one or more *means of egress* design requirements, such as required number of *exits* or *exit access* travel distance, and provides for a protected path of egress travel to the *exit discharge* or *public way*.

INTERIOR FINISH. Interior finish includes *interior wall and ceiling finish* and *interior floor finish*.

INTERIOR FLOOR FINISH. The exposed floor surfaces of buildings including coverings applied over a finished floor or *stair*, including risers.

INTERIOR FLOOR-WALL BASE. *Interior floor finish trim* used to provide a functional or decorative border at the intersection of walls and floors.

INTERIOR SURFACES. Surfaces other than weather exposed surfaces.

INTERIOR WALL AND CEILING FINISH. The exposed *interior surfaces* of buildings, including but not limited to: fixed or movable walls and partitions; toilet room privacy partitions; columns; ceilings; and interior wainscoting, paneling or other finish applied structurally or for decoration,

acoustical correction, surface insulation, structural fire resistance or similar purposes, but not including *trim*.

INTERLAYMENT. A layer of felt or nonbituminous saturated felt not less than 18 inches (457 mm) wide, shingled between each course of a wood-shake *roof covering*.

INTUMESCENT FIRE-RESISTANT COATINGS. Thin film liquid mixture applied to substrates by brush, roller, spray or trowel which expands into a protective foamed layer to provide fire-resistant protection of the substrates when exposed to flame or intense heat.

JOINT. The opening in or between adjacent assemblies that is created due to building tolerances, or is designed to allow independent movement of the building in any plane caused by thermal, seismic, wind or any other loading.

JURISDICTION. The governmental unit that has adopted this code under due legislative authority.

L RATING. The air leakage rating of a *through penetration firestop system* or a fire-resistant *joint system* when tested in accordance with UL 1479 or UL 2079, respectively.

LABEL. An identification applied on a product by the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the product or material and the name and identification of an *approved agency*, and that indicates that the representative sample of the product or material has been tested and evaluated by an *approved agency* (see Section 1703.5, “Manufacturer’s designation” and “Mark”).

LABELED. Equipment, materials or products to which has been affixed a *label*, seal, symbol or other identifying *mark* of a nationally recognized testing laboratory, *approved agency* or other organization concerned with product evaluation that maintains periodic inspection of the production of the above-labeled items and whose labeling indicates either that the equipment, material or product meets identified standards or has been tested and found suitable for a specified purpose.

LEVEL OF EXIT DISCHARGE. See “Exit discharge, level of.”

LIGHT-DIFFUSING SYSTEM. Construction consisting in whole or in part of lenses, panels, grids or baffles made with light-transmitting plastics positioned below independently mounted electrical light sources, skylights or light-transmitting plastic roof panels. Lenses, panels, grids and baffles that are part of an electrical fixture shall not be considered as a light-diffusing system.

LIGHT-FRAME CONSTRUCTION. A type of construction whose vertical and horizontal structural elements are primarily formed by a system of repetitive wood or cold-formed steel framing members.

LIGHT-TRANSMITTING PLASTIC ROOF PANELS. Structural plastic panels other than skylights that are fastened to structural members, or panels or sheathing and that are used as light-transmitting media in the plane of the roof.

LIGHT-TRANSMITTING PLASTIC WALL PANELS. Plastic materials that are fastened to structural members, or to structural panels or sheathing, and that are used as light-transmitting media in *exterior walls*.

LIMIT OF MODERATE WAVE ACTION. Line shown on FIRMs to indicate the inland limit of the 1½-foot (457 mm) breaking wave height during the base flood.

LIMIT STATE. A condition beyond which a structure or member becomes unfit for service and is judged to be no longer useful for its intended function (serviceability limit state) or to be unsafe (strength limit state).

LIQUID. A material that has a melting point that is equal to or less than 68°F (20°C) and a *boiling point* that is greater than 68°F (20°C) at 14.7 pounds per square inch absolute (psia) (101 kPa). When not otherwise identified, the term “liquid” includes both *flammable* and *combustible liquids*.

LIQUID STORAGE ROOM. A room classified as a Group H-3 occupancy used for the storage of *flammable* or *combustible liquids* in a closed condition.

LIQUID USE, DISPENSING AND MIXING ROOM. A room in which Class I, II and IIIA *flammable* or *combustible liquids* are *used*, dispensed or mixed in open containers.

LISTED. Equipment, materials, products or services included in a list published by an organization acceptable to the *building official* and concerned with evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and whose listing states either that the equipment, material, product or service meets identified standards or has been tested and found suitable for a specified purpose.

LIVE/WORK UNIT. A *dwelling unit* or *sleeping unit* in which a significant portion of the space includes a nonresidential use that is operated by the tenant.

LIVE LOAD. A *load* produced by the use and occupancy of the building or other structure that does not include construction or environmental *loads* such as wind load, snow load, rain load, earthquake load, flood load or *dead load*.

LIVE LOAD, ROOF. A *load* on a roof produced:

1. During maintenance by workers, equipment and materials;
2. During the life of the structure by movable objects such as planters or other similar small decorative appurtenances that are not occupancy related; or
3. By the use and occupancy of the roof such as for roof gardens or assembly areas.

LOAD AND RESISTANCE FACTOR DESIGN (LRFD). A method of proportioning structural members and their connections using load and *resistance factors* such that no applicable *limit state* is reached when the structure is subjected to appropriate *load* combinations. The term “LRFD” is used in the design of steel and wood structures.

LOAD EFFECTS. Forces and deformations produced in structural members by the applied *loads*.

LOAD FACTOR. A factor that accounts for deviations of the actual *load* from the *nominal load*, for uncertainties in the analysis that transforms the *load* into a *load effect*, and for the probability that more than one extreme *load* will occur simultaneously.

DEFINITIONS

LOADS. Forces or other actions that result from the weight of building materials, occupants and their possessions, environmental effects, differential movement and restrained dimensional changes. Permanent loads are those loads in which variations over time are rare or of small magnitude, such as *dead loads*. All other loads are variable loads (see “*Nominal loads*”).

LODGING HOUSE. A one-family dwelling where one or more occupants are primarily permanent in nature and rent is paid for guest rooms.

LOT. A portion or parcel of land considered as a unit.

LOT LINE. A line dividing one lot from another, or from a street or any public place.

LOW-ENERGY POWER-OPERATED DOOR. Swinging door which opens automatically upon an action by a pedestrian such as pressing a push plate or waving a hand in front of a sensor. The door closes automatically, and operates with decreased forces and decreased speeds (see “Power-assisted door” and “Power-operated door”).

LOWER FLAMMABLE LIMIT (LFL). The minimum concentration of vapor in air at which propagation of flame will occur in the presence of an ignition source. The LFL is sometimes referred to as “LEL” or “lower explosive limit.”

LOWEST FLOOR. The floor of the lowest enclosed area, including *basement*, but excluding any unfinished or flood-resistant enclosure, usable solely for vehicle parking, building access or limited storage provided that such enclosure is not built to render the structure in violation of Section 1612 and Appendix G.

MAIN WINDFORCE-RESISTING SYSTEM. An assemblage of structural elements assigned to provide support and stability for the overall structure. The system generally receives wind loading from more than one surface

MALL BUILDING, COVERED and MALL BUILDING, OPEN. See “Covered mall building.”

MANUAL FIRE ALARM BOX. A manually operated device used to initiate an *alarm signal*.

MANUFACTURER’S DESIGNATION. An identification applied on a product by the manufacturer indicating that a product or material complies with a specified standard or set of rules (see “*Label*” and “*Mark*”).

MARK. An identification applied on a product by the manufacturer indicating the name of the manufacturer and the function of a product or material (see “*Label*” and “Manufacturer’s designation”).

MARQUEE. A *canopy* that has a top surface which is sloped less than 25 degrees from the horizontal and is located less than 10 feet (3048 mm) from operable openings above or adjacent to the level of the marquee.

MASONRY. A built-up construction or combination of building units or materials of clay, shale, concrete, glass, gypsum, stone or other *approved* units bonded together with or without *mortar* or grout or other accepted methods of joining.

Glass unit masonry. Masonry composed of glass units bonded by *mortar*.

Plain masonry. Masonry in which the tensile resistance of the masonry is taken into consideration and the effects of stresses in reinforcement are neglected.

Reinforced masonry. Masonry construction in which reinforcement acting in conjunction with the masonry is used to resist forces.

Solid masonry. Masonry consisting of solid masonry units laid contiguously with the *joints* between the units filled with *mortar*.

Unreinforced (plain) masonry. Masonry in which the tensile resistance of masonry is taken into consideration and the resistance of the reinforcing steel, if present, is neglected.

MASONRY UNIT. *Brick*, tile, stone, glass block or concrete block conforming to the requirements specified in Section 2103.

Hollow. A masonry unit whose net cross-sectional *area* in any plane parallel to the load-bearing surface is less than 75 percent of its gross cross-sectional *area* measured in the same plane.

Solid. A masonry unit whose net cross-sectional *area* in every plane parallel to the load-bearing surface is 75 percent or more of its gross cross-sectional *area* measured in the same plane.

MASTIC FIRE-RESISTANT COATINGS. Liquid mixture applied to a substrate by brush, roller, spray or trowel that provides fire-resistant protection of a substrate when exposed to flame or intense heat.

MEANS OF EGRESS. A continuous and unobstructed path of vertical and horizontal egress travel from any occupied portion of a building or structure to a *public way*. A means of egress consists of three separate and distinct parts: the *exit access*, the *exit* and the *exit discharge*.

MECHANICAL-ACCESS OPEN PARKING GARAGES. *Open parking garages* employing parking machines, lifts, elevators or other mechanical devices for vehicles moving from and to street level and in which public occupancy is prohibited above the street level.

MECHANICAL EQUIPMENT SCREEN. A rooftop structure, not covered by a roof, used to aesthetically conceal plumbing, electrical or mechanical equipment from view.

MEDICAL CARE. Care involving medical or surgical procedures, nursing or for psychiatric purposes.

MEMBRANE-COVERED CABLE STRUCTURE. A nonpressurized structure in which a mast and cable system provides support and tension to the membrane weather barrier and the membrane imparts stability to the structure.

MEMBRANE-COVERED FRAME STRUCTURE. A nonpressurized building wherein the structure is composed of a rigid framework to support a tensioned membrane which provides the weather barrier.

MEMBRANE PENETRATION. A breach in one side of a floor-ceiling, roof-ceiling or wall assembly to accommodate an item installed into or passing through the breach.

MEMBRANE-PENETRATION FIRESTOP. A material, device or construction installed to resist for a prescribed time period the passage of flame and heat through openings in a protective membrane in order to accommodate cables, cable trays, conduit, tubing, pipes or similar items.

MEMBRANE-PENETRATION FIRESTOP SYSTEM. An assemblage consisting of a fire-resistance-rated floor-ceiling, roof-ceiling or wall assembly, one or more penetrating items installed into or passing through the breach in one side of the assembly and the materials or devices, or both, installed to resist the spread of fire into the assembly for a prescribed period of time.

MERCHANDISE PAD. A merchandise pad is an area for display of merchandise surrounded by *aisles*, permanent fixtures or walls. Merchandise pads contain elements such as nonfixed and moveable fixtures, cases, racks, counters and partitions as indicated in Section 105.2 from which customers browse or shop.

METAL COMPOSITE MATERIAL (MCM). A factory-manufactured panel consisting of metal skins bonded to both faces of a solid plastic core.

METAL COMPOSITE MATERIAL (MCM) SYSTEM. An exterior wall covering fabricated using MCM in a specific assembly including *joints*, seams, attachments, substrate, framing and other details as appropriate to a particular design.

METAL ROOF PANEL. An interlocking metal sheet having a minimum installed weather exposure of 3 square feet (0.279 m²) per sheet.

METAL ROOF SHINGLE. An interlocking metal sheet having an installed weather exposure less than 3 square feet (0.279 m²) per sheet.

MEZZANINE. An intermediate level or levels between the floor and ceiling of any *story* and in accordance with Section 505.

MICROPILE. A micropile is a bored, grouted-in-place *deep foundation* element that develops its load-carrying capacity by means of a bond zone in soil, bedrock or a combination of soil and bedrock.

MINERAL BOARD. A rigid felted thermal insulation board consisting of either felted *mineral fiber* or cellular beads of expanded aggregate formed into flat rectangular units.

MINERAL FIBER. Insulation composed principally of fibers manufactured from rock, slag or glass, with or without binders.

MINERAL WOOL. Synthetic vitreous fiber insulation made by melting predominately igneous rock or furnace slag, and other inorganic materials, and then physically forming the melt into fibers.

MODIFIED BITUMEN ROOF COVERING. One or more layers of polymer-modified asphalt sheets. The sheet materials shall be fully adhered or mechanically attached to the substrate or held in place with an *approved* ballast layer.

MORTAR. A mixture consisting of cementitious materials, fine aggregates, water, with or without admixtures, that is used to construct unit masonry assemblies.

MORTAR, SURFACE-BONDING. A mixture to bond concrete *masonry units* that contains hydraulic cement, glass fiber reinforcement with or without inorganic fillers or organic modifiers and water.

MULTILEVEL ASSEMBLY SEATING. Seating that is arranged in distinct levels where each level is comprised of either multiple rows, or a single row of box seats accessed from a separate level.

MULTIPLE-STATION ALARM DEVICE. Two or more single-station alarm devices that can be interconnected such that actuation of one causes all integral or separate audible alarms to operate. A multiple-station alarm device can consist of one single-station alarm device having connections to other detectors or to a *manual fire alarm box*.

MULTIPLE-STATION SMOKE ALARM. Two or more single-station alarm devices that are capable of interconnection such that actuation of one causes the appropriate *alarm signal* to operate in all interconnected alarms.

MULTISTORY UNIT. A *dwelling unit* or *sleeping unit* with *habitable space* located on more than one *story*.

NAILING, BOUNDARY. A special nailing pattern required by design at the boundaries of *diaphragms*.

NAILING, EDGE. A special nailing pattern required by design at the edges of each panel within the assembly of a *diaphragm* or *shear wall*.

NAILING, FIELD. Nailing required between the sheathing panels and framing members at locations other than *boundary nailing* and *edge nailing*.

NATURALLY DURABLE WOOD. The heartwood of the following species except for the occasional piece with corner sapwood, provided 90 percent or more of the width of each side on which it occurs is heartwood.

Decay resistant. Redwood, cedar, black locust and black walnut.

Termite resistant. Redwood, Alaska yellow cedar, Eastern red cedar and Western red cedar.

NOMINAL LOADS. The magnitudes of the *loads* specified in Chapter 16 (dead, live, soil, wind, snow, rain, *flood* and earthquake).

NOMINAL SIZE (LUMBER). The commercial size designation of width and depth, in standard sawn lumber and glued-laminated lumber *grades*; somewhat larger than the standard net size of dressed lumber, in accordance with DOCPS 20 for sawn lumber and with the ANSI/AWC NDS for glued-laminated lumber.

NONCOMBUSTIBLE MEMBRANE STRUCTURE. A membrane structure in which the membrane and all component parts of the structure are noncombustible.

NONSTRUCTURAL CONCRETE. Any element made of plain or reinforced concrete that is not part of a structural system required to transfer either gravity or lateral loads to the ground.

NORMAL TEMPERATURE AND PRESSURE (NTP). A temperature of 70°F (21°C) and a pressure of 1 atmosphere [14.7 psia (101 kPa)].

DEFINITIONS

NOSING. The leading edge of treads of *stairs* and of landings at the top of *stairway flights*.

NOTIFICATION ZONE. See “Zone, notification.”

NUISANCE ALARM. An alarm caused by mechanical failure, malfunction, improper installation or lack of proper maintenance, or an alarm activated by a cause that cannot be determined.

NURSING HOMES. Facilities that provide care, including both intermediate care facilities and skilled nursing facilities where any of the persons are *incapable of self-preservation*.

OCCUPANT LOAD. The number of persons for which the *means of egress* of a building or portion thereof is designed.

OCCUPIABLE SPACE. A room or enclosed space designed for human occupancy in which individuals congregate for amusement, educational or similar purposes or in which occupants are engaged at labor, and which is equipped with *means of egress* and light and *ventilation* facilities meeting the requirements of this code.

OPEN-ENDED CORRIDOR. An interior corridor that is open on each end and connects to an exterior *stairway* or *ramp* at each end with no intervening doors or separation from the corridor.

OPEN PARKING GARAGE. A structure or portion of a structure with the openings as described in Section 406.5.2 on two or more sides that is used for the parking or storage of private motor vehicles as described in Section 406.5.3.

OPEN SYSTEM. The *use* of a *solid* or *liquid hazardous material* involving a vessel or system that is continuously open to the atmosphere during normal operations and where vapors are liberated, or the product is exposed to the atmosphere during normal operations. Examples of open systems for *solids* and *liquids* include dispensing from or into open beakers or containers, dip tank and plating tank operations.

OPERATING BUILDING. A building occupied in conjunction with the manufacture, transportation or *use* of explosive materials. Operating buildings are separated from one another with the use of intraplant or intraline distances.

ORDINARY PRECAST STRUCTURAL WALL. See Section 1905.1.1.

ORDINARY REINFORCED CONCRETE STRUCTURAL WALL. See Section 1905.1.1.

ORDINARY STRUCTURAL PLAIN CONCRETE WALL. See Section 1905.1.1.

ORGANIC PEROXIDE. An organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms have been replaced by an organic radical. Organic peroxides can pose an *explosion* hazard (*detonation* or *deflagration*) or they can be shock sensitive. They can also decompose into various unstable compounds over an extended period of time.

Class I. Those formulations that are capable of *deflagration* but not *detonation*.

Class II. Those formulations that burn very rapidly and that pose a moderate reactivity hazard.

Class III. Those formulations that burn rapidly and that pose a moderate reactivity hazard.

Class IV. Those formulations that burn in the same manner as ordinary combustibles and that pose a minimal reactivity hazard.

Class V. Those formulations that burn with less intensity than ordinary combustibles or do not sustain combustion and that pose no reactivity hazard.

Unclassified detonable. Organic peroxides that are capable of *detonation*. These peroxides pose an extremely high *explosion* hazard through rapid explosive decomposition.

ORTHOGONAL. To be in two horizontal directions, at 90 degrees (1.57 rad) to each other.

OTHER STRUCTURES (for Chapters 16-23). Structures, other than buildings, for which *loads* are specified in Chapter 16.

OUTPATIENT CLINIC. See “Clinic, outpatient.”

OWNER. Any person, agent, operator, entity, firm or corporation having any legal or equitable interest in the property; or recorded in the official records of the state, county or municipality as holding an interest or title to the property; or otherwise having possession or control of the property, including the guardian of the estate of any such person, and the executor or administrator of the estate of such person if ordered to take possession of real property by a court.

OXIDIZER. A material that readily yields oxygen or other *oxidizing gas*, or that readily reacts to promote or initiate combustion of combustible materials and, if heated or contaminated, can result in vigorous self-sustained decomposition.

Class 4. An oxidizer that can undergo an explosive reaction due to contamination or exposure to thermal or physical shock and that causes a severe increase in the burning rate of combustible materials with which it comes into contact. Additionally, the oxidizer causes a severe increase in the burning rate and can cause spontaneous ignition of combustibles.

Class 3. An oxidizer that causes a severe increase in the burning rate of combustible materials with which it comes in contact.

Class 2. An oxidizer that will cause a moderate increase in the burning rate of combustible materials with which it comes in contact.

Class 1. An oxidizer that does not moderately increase the burning rate of combustible materials.

OXIDIZING GAS. A gas that can support and accelerate combustion of other materials more than air does.

PANEL (PART OF A STRUCTURE). The section of a floor, wall or roof comprised between the supporting frame of two adjacent rows of columns and girders or column bands of floor or roof construction.

PANIC HARDWARE. A door-latching assembly incorporating a device that releases the latch upon the application of a force in the direction of egress travel. See “Fire exit hardware.”

PARTICLEBOARD. A generic term for a panel primarily composed of cellulosic materials (usually wood), generally in the form of discrete pieces or particles, as distinguished from fibers. The cellulosic material is combined with synthetic resin or other suitable bonding system by a process in which the interparticle bond is created by the bonding system under heat and pressure.

PENETRATION FIRESTOP. A through-penetration firestop or a *membrane-penetration firestop*.

PENTHOUSE. An enclosed, unoccupied rooftop structure used for sheltering mechanical and electrical equipment, tanks, elevators and related machinery, and vertical *shaft* openings.

PERFORMANCE CATEGORY. A designation of wood structural panels as related to the panel performance used in Chapter 23.

PERMIT. An official document or certificate issued by the *building official* that authorizes performance of a specified activity.

PERSON. An individual, heirs, executors, administrators or assigns, and also includes a firm, partnership or corporation, its or their successors or assigns, or the agent of any of the aforesaid.

PERSONAL CARE SERVICE. The care of persons who do not require *medical care*. Personal care involves responsibility for the safety of the persons while inside the building.

PHOTOLUMINESCENT. Having the property of emitting light that continues for a length of time after excitation by visible or invisible light has been removed.

PHOTOVOLTAIC MODULE. A complete, environmentally protected unit consisting of solar cells, optics and other components, exclusive of tracker, designed to generate DC power when exposed to sunlight.

PHOTOVOLTAIC PANEL. A collection of modules mechanically fastened together, wired and designed to provide a field-installable unit.

PHOTOVOLTAIC PANEL SYSTEM. A system that incorporates discrete photovoltaic panels, that converts solar radiation into electricity, including rack support systems.

PHOTOVOLTAIC SHINGLES. A *roof covering* resembling shingles that incorporates photovoltaic modules.

PHYSICAL HAZARD. A chemical for which there is evidence that it is a *combustible liquid*, *cryogenic fluid*, *explosive*, flammable (*solid*, *liquid* or *gas*), *organic peroxide* (*solid* or *liquid*), *oxidizer* (*solid* or *liquid*), *oxidizing gas*, *pyrophoric* (*solid*, *liquid* or *gas*), *unstable (reactive) material* (*solid*, *liquid* or *gas*) or *water-reactive material* (*solid* or *liquid*).

PHYSIOLOGICAL WARNING THRESHOLD LEVEL. A concentration of air-borne contaminants, normally expressed in parts per million (ppm) or milligrams per cubic meter (mg/m³), that represents the concentration at which persons can sense the presence of the contaminant due to odor, irritation or other quick-acting physiological response. When used in conjunction with the permissible exposure limit (PEL) the physiological warning threshold levels are

those consistent with the classification system used to establish the PEL. See the definition of “Permissible exposure limit (PEL)” in the *Fire Code*.

PLACE OF RELIGIOUS WORSHIP. See “Religious worship, place of.”

PLASTIC, APPROVED. Any thermoplastic, thermosetting or reinforced thermosetting plastic material that conforms to combustibility classifications specified in the section applicable to the application and plastic type.

PLASTIC COMPOSITE. A generic designation that refers to wood/plastic composites and plastic lumber.

PLASTIC GLAZING. Plastic materials that are glazed or set in frame or sash and not held by mechanical fasteners that pass through the glazing material.

PLASTIC LUMBER. A manufactured product made primarily of plastic materials (filled or unfilled) which is generally rectangular in cross section.

PLATFORM. A raised area within a building used for worship, the presentation of music, plays or other entertainment; the head table for special guests; the raised area for lecturers and speakers; boxing and wrestling rings; theater-in-the-round *stages*; and similar purposes wherein, other than horizontal sliding curtains, there are no overhead hanging curtains, drops, scenery or stage effects other than lighting and sound. A temporary platform is one installed for not more than 30 days.

POLYPROPYLENE SIDING. A shaped material, made principally from polypropylene homopolymer, or copolymer, which in some cases contains fillers or reinforcements, that is used to clad *exterior walls* of buildings.

PORCELAIN TILE. Tile that conforms to the requirements of ANSI A137.1.3, Section 3.0 for ceramic tile having an absorption of 0.5 percent or less in accordance with ANSI A137.1, Section 4.1 and Section 6.1 Table 10.

POSITIVE ROOF DRAINAGE. The drainage condition in which consideration has been made for all loading deflections of the *roof deck*, and additional slope has been provided to ensure drainage of the roof within 48 hours of precipitation.

POWER-ASSISTED DOOR. Swinging door which opens by reduced pushing or pulling force on the door-operating hardware. The door closes automatically after the pushing or pulling force is released and functions with decreased forces. See “Low-energy power-operated door” and “Power-operated door.”

POWER-OPERATED DOOR. Swinging, sliding, or folding door which opens automatically when approached by a pedestrian or opens automatically upon an action by a pedestrian. The door closes automatically and includes provisions such as presence sensors to prevent entrapment. See “Low energy power-operated door” and “Power-assisted door.”

PREFABRICATED WOOD I-JOIST. Structural member manufactured using sawn or structural composite lumber flanges and wood structural panel webs bonded together with exterior exposure adhesives, which forms an “I” cross-sectional shape.

DEFINITIONS

PRESTRESSED MASONRY. *Masonry* in which internal stresses have been introduced to counteract potential tensile stresses in *masonry* resulting from applied *loads*.

PRIMARY STRUCTURAL FRAME. The primary structural frame shall include all of the following structural members:

1. The columns.
2. Structural members having direct connections to the columns, including girders, beams, trusses and spandrels.
3. Members of the floor construction and roof construction having direct connections to the columns.
4. Bracing members that are essential to the vertical stability of the primary structural frame under gravity loading shall be considered part of the primary structural frame whether or not the bracing member carries gravity *loads*.

PRIVATE GARAGE. A building or portion of a building in which motor vehicles used by the tenants of the building or buildings on the premises are stored or kept, without provisions for repairing or servicing such vehicles for profit.

PROSCENIUM WALL. The wall that separates the *stage* from the auditorium or assembly seating area.

PSYCHIATRIC HOSPITALS. See “Hospitals.”

PUBLIC ENTRANCE. An entrance that is not a *service entrance* or a *restricted entrance*.

PUBLIC-USE AREAS. Interior or exterior rooms or spaces that are made available to the general public.

PUBLIC WAY. A street, alley or other parcel of land open to the outside air leading to a street, that has been deeded, dedicated or otherwise permanently appropriated to the public for public use and which has a clear width and height of not less than 10 feet (3048 mm).

PYROPHORIC. A chemical with an auto-ignition temperature in air, at or below a temperature of 130°F (54.4°C).

PYROTECHNIC COMPOSITION. A chemical mixture that produces visible light displays or sounds through a self-propagating, heat-releasing chemical reaction which is initiated by ignition.

RADIANT BARRIER. A material having a low-emittance surface of 0.1 or less installed in building assemblies.

RAMP. A walking surface that has a running slope steeper than one unit vertical in 20 units horizontal (5-percent slope).

RAMP-ACCESS OPEN PARKING GARAGES. *Open parking garages* employing a series of continuously rising floors or a series of interconnecting ramps between floors permitting the movement of vehicles under their own power from and to the street level.

RAMP, EXIT ACCESS. See “Exit access ramp.”

RAMP, EXTERIOR EXIT. See “Exterior exit ramp.”

RAMP, INTERIOR EXIT. See “Interior exit ramp.”

RECORD DRAWINGS. Drawings (“as built”) that document the location of all devices, appliances, wiring

sequences, wiring methods and connections of the components of a *fire alarm system* as installed.

REFLECTIVE PLASTIC CORE INSULATION. An insulation material packaged in rolls, that is less than 1/2 inch (12.7 mm) thick, with not less than one exterior low-emittance surface (0.1 or less) and a core material containing voids or cells.

REGISTERED DESIGN PROFESSIONAL. An individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or *jurisdiction* in which the project is to be constructed.

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. A *registered design professional* engaged by the owner or the owner’s authorized agent to review and coordinate certain aspects of the project, as determined by the *building official*, for compatibility with the design of the building or structure, including submittal documents prepared by others, deferred submittal documents and phased submittal documents.

RELIGIOUS WORSHIP, PLACE OF. A building or portion thereof intended for the performance of religious services.

REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.

REROOFING. The process of recovering or replacing an existing *roof covering*. See “Roof recover” and “Roof replacement.”

RESIDENTIAL AIRCRAFT HANGAR. An accessory building less than 2,000 square feet (186 m²) and 20 feet (6096 mm) in *building height* constructed on a one- or two-family property where aircraft are stored. Such use will be considered as a residential accessory use incidental to the dwelling.

RESISTANCE FACTOR. A factor that accounts for deviations of the actual strength from the *nominal strength* and the manner and consequences of failure (also called “strength reduction factor”).

RESTRICTED ENTRANCE. An entrance that is made available for *common use* on a controlled basis, but not public use, and that is not a *service entrance*.

RETRACTABLE AWNING. A retractable *awning* is a cover with a frame that retracts against a building or other structure to which it is entirely supported.

RISK CATEGORY. A categorization of buildings and other structures for determination of *flood*, wind, snow, ice and earthquake *loads* based on the risk associated with unacceptable performance.

RISK-TARGETED MAXIMUM CONSIDERED EARTHQUAKE (MCE_R) GROUND MOTION RESPONSE ACCELERATIONS. The most severe earthquake effects considered by this code, determined for the orientation that results in the largest maximum response to horizontal ground motions and with adjustment for targeted risk.

ROOF ASSEMBLY (For application to Chapter 15 only).

A system designed to provide weather protection and resistance to design loads. The system consists of a *roof covering* and *roof deck* or a single component serving as both the roof covering and the *roof deck*. A roof assembly includes the *roof deck*, *vapor retarder*, substrate or thermal barrier, insulation, *vapor retarder* and *roof covering*.

ROOF COVERING. The covering applied to the *roof deck* for weather resistance, fire classification or appearance.

ROOF COVERING SYSTEM. See “Roof assembly.”

ROOF DECK. The flat or sloped surface constructed on top of the *exterior walls* of a building or other supports for the purpose of enclosing the *story* below, or sheltering an area, to protect it from the elements, not including its supporting members or vertical supports.

ROOF DRAINAGE, POSITIVE. See “Positive roof drainage.”

ROOF RECOVER. The process of installing an additional *roof covering* over a prepared existing *roof covering* without removing the existing *roof covering*.

ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance.

ROOF REPLACEMENT. The process of removing the existing *roof covering*, repairing any damaged substrate and installing a new *roof covering*.

ROOF VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, *attics*, cathedral ceilings or other enclosed spaces over which a *roof assembly* is installed.

ROOFTOP STRUCTURE. A structure erected on top of the *roof deck* or on top of any part of a building.

RUNNING BOND. The placement of *masonry units* such that *head joints* in successive courses are horizontally offset at least one-quarter the unit length.

SALLYPORT. A security vestibule with two or more doors or gates where the intended purpose is to prevent continuous and unobstructed passage by allowing the release of only one door or gate at a time.

SCISSOR STAIRWAY. Two interlocking *stairways* providing two separate paths of egress located within one *exit enclosure*.

SCUPPER. An opening in a wall or parapet that allows water to drain from a roof.

SECONDARY MEMBERS. The following structural members shall be considered secondary members and not part of the *primary structural frame*:

1. Structural members not having direct connections to the columns.
2. Members of the floor construction and roof construction not having direct connections to the columns.
3. Bracing members other than those that are part of the *primary structural frame*.

SEISMIC DESIGN CATEGORY. A classification assigned to a structure based on its *risk category* and the severity of the *design earthquake ground motion* at the site.

SEISMIC FORCE-RESISTING SYSTEM. That part of the structural system that has been considered in the design to provide the required resistance to the prescribed seismic forces.

SELF-CLOSING. As applied to a *fire door* or other opening protective, means equipped with an device that will ensure closing after having been opened.

SELF-LUMINOUS. Illuminated by a self-contained power source, other than batteries, and operated independently of external power sources.

SELF-PRESERVATION, INCAPABLE OF. See “Incapable of self-preservation.”

SELF-SERVICE STORAGE FACILITY. Real property designed and used for the purpose of renting or leasing individual storage spaces to customers for the purpose of storing and removing personal property on a self-service basis.

SERVICE CORRIDOR. A fully enclosed passage used for transporting *HPM* and purposes other than required *means of egress*.

SERVICE ENTRANCE. An entrance intended primarily for delivery of goods or services.

SHAFT. An enclosed space extending through one or more *stories* of a building, connecting vertical openings in successive floors, or floors and roof.

SHAFT ENCLOSURE. The walls or construction forming the boundaries of a *shaft*.

SHALLOW FOUNDATION. A shallow foundation is an individual or strip footing, a mat foundation, a slab-on-grade foundation or a similar foundation element.

SHEAR WALL (for Chapter 23). A wall designed to resist lateral forces parallel to the plane of a wall.

Shear wall, perforated. A wood structural panel sheathed wall with openings, that has not been specifically designed and detailed for force transfer around openings.

Shear wall segment, perforated. A section of shear wall with full-height sheathing that meets the height-to-width ratio limits of Section 4.3.4 of AWC SDPWS.

SHINGLE FASHION. A method of installing roof or wall coverings, water-resistive barriers, flashing or other building components such that upper layers of material are placed overlapping lower layers of material to provide for drainage via gravity and moisture control.

SINGLE-PLY MEMBRANE. A roofing membrane that is field applied using one layer of membrane material (either homogeneous or composite) rather than multiple layers.

SINGLE-STATION SMOKE ALARM. An assembly incorporating the detector, the control equipment and the alarm-sounding device in one unit, operated from a power supply either in the unit or obtained at the point of installation.

DEFINITIONS

SITE. A parcel of land bounded by a *lot line* or a designated portion of a public right-of-way.

SITE CLASS. A classification assigned to a site based on the types of soils present and their engineering properties as defined in Section 1613.3.2.

SITE COEFFICIENTS. The values of F_a and F_v indicated in Tables 1613.3.3(1) and 1613.3.3(2), respectively.

SITE-FABRICATED STRETCH SYSTEM. A system, fabricated on site and intended for acoustical, tackable or aesthetic purposes, that is composed of three elements:

1. A frame (constructed of plastic, wood, metal or other material) used to hold fabric in place;
2. A core material (infill, with the correct properties for the application); and
3. An outside layer, composed of a textile, fabric or vinyl, that is stretched taut and held in place by tension or mechanical fasteners via the frame.

SKYLIGHT, UNIT. A factory-assembled, glazed fenestration unit, containing one panel of glazing material that allows for natural lighting through an opening in the *roof assembly* while preserving the weather-resistant barrier of the roof.

SKYLIGHTS AND SLOPED GLAZING. Glass or other transparent or translucent glazing material installed at a slope of 15 degrees (0.26 rad) or more from vertical. Glazing material in skylights, including *unit skylights*, *tubular daylighting devices*, solariums, *sunrooms*, roofs and sloped walls, are included in this definition.

SLEEPING UNIT. A room or space in which people sleep, which can also include permanent provisions for living, eating, and either sanitation or kitchen facilities but not both. Such rooms and spaces that are also part of a *dwelling unit* are not sleeping units.

SMOKE ALARM. A single- or multiple-station alarm responsive to smoke. See “Multiple-station smoke alarm” and “Single-station smoke alarm.”

SMOKE BARRIER. A continuous membrane, either vertical or horizontal, such as a wall, floor or ceiling assembly, that is designed and constructed to restrict the movement of smoke.

SMOKE COMPARTMENT. A space within a building enclosed by *smoke barriers* on all sides, including the top and bottom.

SMOKE DAMPER. A *listed* device installed in ducts and air transfer openings designed to resist the passage of smoke. The device is installed to operate *automatically*, controlled by a smoke detection system, and where required, is capable of being positioned from a *fire command center*.

SMOKE DETECTOR. A *listed* device that senses visible or invisible particles of combustion.

SMOKE-DEVELOPED INDEX. A comparative measure, expressed as a dimensionless number, derived from measurements of smoke obscuration versus time for a material tested in accordance with ASTM E84.

SMOKE-PROTECTED ASSEMBLY SEATING. Seating served by *means of egress* that is not subject to smoke accumulation within or under a structure.

SMOKEPROOF ENCLOSURE. An *exit stairway* or *ramp* designed and constructed so that the movement of the products of combustion produced by a fire occurring in any part of the building into the enclosure is limited.

SOLID. A material that has a melting point, decomposes or sublimates at a temperature greater than 68°F (20°C).

SPECIAL AMUSEMENT BUILDING. A special amusement building is any temporary or permanent building or portion thereof that is occupied for amusement, entertainment or educational purposes and that contains a device or system that conveys passengers or provides a walkway along, around or over a course in any direction so arranged that the *means of egress* path is not readily apparent due to visual or audio distractions or is intentionally confounded or is not readily available because of the nature of the attraction or mode of conveyance through the building or structure.

SPECIAL FLOOD HAZARD AREA. The land area subject to flood hazards and shown on a *Flood Insurance Rate Map* or other flood hazard map as Zone A, AE, A1-30, A99, AR, AO, AH, V, VO, VE or V1-30.

SPECIAL INSPECTION. Inspection of construction requiring the expertise of an *approved special inspector* in order to ensure compliance with this code and the *approved construction documents*.

Continuous special inspection. Special inspection by the *special inspector* who is present continuously when and where the work to be inspected is being performed.

Periodic special inspection. Special inspection by the *special inspector* who is intermittently present where the work to be inspected has been or is being performed.

SPECIAL INSPECTOR. A qualified person employed or retained by an *approved* agency and *approved* by the *building official* as having the competence necessary to inspect a particular type of construction requiring *special inspection*.

SPECIAL STRUCTURAL WALL. See Section 1905.1.1.

SPECIFIED COMPRESSIVE STRENGTH OF MASONRY, f'_m . Minimum compressive strength, expressed as force per unit of net cross-sectional area, required of the *masonry* used in construction by the *approved construction documents*, and upon which the project design is based. Whenever the quantity f'_m is under the radical sign, the square root of numerical value only is intended and the result has units of pounds per square inch (psi) (MPa).

SPLICE. The result of a factory and/or field method of joining or connecting two or more lengths of a *fire-resistant joint system* into a continuous entity.

SPORT ACTIVITY, AREA OF. See “Area of sport activity.”

SPRAYED FIRE-RESISTANT MATERIALS. Cementitious or fibrous materials that are sprayed to provide fire-resistant protection of the substrates.

STAGE. A space within a building utilized for entertainment or presentations, which includes overhead hanging curtains, drops, scenery or stage effects other than lighting and sound.

STAIR. A change in elevation, consisting of one or more risers.

STAIRWAY. One or more *flights of stairs*, either exterior or interior, with the necessary landings and platforms connecting them, to form a continuous and uninterrupted passage from one level to another.

STAIRWAY, EXIT ACCESS. See “Exit access stairway.”

STAIRWAY, EXTERIOR EXIT. See “Exterior exit stairway.”

STAIRWAY, INTERIOR EXIT. See “Interior exit stairway.”

STAIRWAY, SCISSOR. See “Scissor stairway.”

STAIRWAY, SPIRAL. A *stairway* having a closed circular form in its plan view with uniform section-shaped treads attached to and radiating from a minimum-diameter supporting column.

STANDBY POWER SYSTEM. A source of automatic electric power of a required capacity and duration to operate required building, hazardous materials or ventilation systems in the event of a failure of the primary power. Standby power systems are required for electrical loads where interruption of the primary power could create hazards or hamper rescue or fire-fighting operations.

STANDPIPE SYSTEM, CLASSES OF. Standpipe classes are as follows:

Class I system. A system providing 2½-inch (64 mm) hose connections to supply water for use by fire departments and those trained in handling heavy fire streams.

Class II system. A system providing 1½-inch (38 mm) hose stations to supply water for use primarily by the building occupants or by the fire department during initial response.

Class III system. A system providing 1½-inch (38 mm) hose stations to supply water for use by building occupants and 2½-inch (64 mm) hose connections to supply a larger volume of water for use by fire departments and those trained in handling heavy fire streams.

STANDPIPE, TYPES OF. Standpipe types are as follows:

Automatic dry. A dry standpipe system, normally filled with pressurized air, that is arranged through the use of a device, such as dry pipe valve, to admit water into the system piping *automatically* upon the opening of a hose valve. The water supply for an *automatic dry* standpipe system shall be capable of supplying the system demand.

Automatic wet. A wet standpipe system that has a water supply that is capable of supplying the system demand *automatically*.

Manual dry. A dry standpipe system that does not have a permanent water supply attached to the system. Manual dry standpipe systems require water from a fire department pumper to be pumped into the system through the fire department connection in order to meet the system demand.

ment pumper to be pumped into the system through the fire department connection in order to meet the system demand.

Manual wet. A wet standpipe system connected to a water supply for the purpose of maintaining water within the system but does not have a water supply capable of delivering the system demand attached to the system. Manual-wet standpipe systems require water from a fire department pumper (or the like) to be pumped into the system in order to meet the system demand.

Semiautomatic dry. A dry standpipe system that is arranged through the use of a device, such as a deluge valve, to admit water into the system piping upon activation of a remote control device located at a hose connection. A remote control activation device shall be provided at each hose connection. The water supply for a semiautomatic dry standpipe system shall be capable of supplying the system demand.

START OF CONSTRUCTION. The date of issuance for new construction and *substantial improvements* to existing structures, provided the actual start of construction, *repair*, reconstruction, rehabilitation, *addition*, placement or other improvement is within 180 days after the date of issuance. The actual start of construction means the first placement of permanent construction of a building (including a manufactured home) on a site, such as the pouring of a slab or footings, installation of pilings or construction of columns.

Permanent construction does not include land preparation (such as clearing, excavation, grading or filling), the installation of streets or walkways, excavation for a *basement*, footings, piers or foundations, the erection of temporary forms or the installation of accessory buildings such as garages or sheds not occupied as *dwelling units* or not part of the main building. For a *substantial improvement*, the actual “start of construction” means the first *alteration* of any wall, ceiling, floor or other structural part of a building, whether or not that *alteration* affects the external dimensions of the building.

STEEL CONSTRUCTION, COLD-FORMED. That type of construction made up entirely or in part of *steel structural members* cold formed to shape from sheet or strip steel such as *roof deck*, floor and wall panels, studs, floor joists, roof joists and other structural elements.

STEEL ELEMENT, STRUCTURAL. Any *steel structural member* of a building or structure consisting of rolled shapes, pipe, hollow structural sections, plates, bars, sheets, rods or steel castings other than cold-formed steel or steel joist members.

STEEL JOIST. Any *steel structural member* of a building or structure made of hot-rolled or cold-formed solid or open-web sections, or riveted or welded bars, strip or sheet steel members, or slotted and expanded, or otherwise deformed rolled sections.

STEEP SLOPE. A roof slope greater than two units vertical in 12 units horizontal (17-percent slope).

STONE MASONRY. *Masonry* composed of field, quarried or *cast stone* units bonded by *mortar*.

DEFINITIONS

STORAGE, HAZARDOUS MATERIALS. The keeping, retention or leaving of hazardous materials in closed containers, tanks, cylinders, or similar vessels; or vessels supplying operations through closed connections to the vessel.

STORAGE RACKS. Cold-formed or hot-rolled steel structural members which are formed into steel storage racks, including pallet storage racks, movable-shelf racks, rack-supported systems, automated storage and retrieval systems (stacker racks), push-back racks, pallet-flow racks, case-flow racks, pick modules and rack-supported platforms. Other types of racks, such as drive-in or drive-through racks, cantilever racks, portable racks or racks made of materials other than steel, are not considered storage racks for the purpose of this code.

STORM SHELTER. A building, structure or portions thereof, constructed in accordance with ICC 500 and designated for use during a severe wind storm event, such as a hurricane or tornado.

Community storm shelter. A storm shelter not defined as a “Residential storm shelter.”

Residential storm shelter. A storm shelter serving occupants of *dwelling units* and having an *occupant load* not exceeding 16 persons.

STORY. That portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above (see “*Basement*,” “*Building height*,” “*Grade plane*” and “*Mezzanine*”). A story is measured as the vertical distance from top to top of two successive tiers of beams or finished floor surfaces and, for the topmost story, from the top of the floor finish to the top of the ceiling joists or, where there is not a ceiling, to the top of the roof rafters.

STORY ABOVE GRADE PLANE. Any *story* having its finished floor surface entirely above *grade plane*, or in which the finished surface of the floor next above is:

1. More than 6 feet (1829 mm) above *grade plane*; or
2. More than 12 feet (3658 mm) above the finished ground level at any point.

STRENGTH (For Chapter 21).

Design strength. Nominal strength multiplied by a strength reduction factor.

Nominal strength. Strength of a member or cross section calculated in accordance with these provisions before application of any strength-reduction factors.

Required strength. Strength of a member or cross section required to resist *factored loads*.

STRENGTH (for Chapter 16).

Nominal strength. The capacity of a structure or member to resist the effects of *loads*, as determined by computations using *specified* material strengths and dimensions and equations derived from accepted principles of structural mechanics or by field tests or laboratory tests of scaled models, allowing for modeling effects and differences between laboratory and field conditions.

Required strength. Strength of a member, cross section or connection required to resist *factored loads* or related

internal moments and forces in such combinations as stipulated by these provisions.

Strength design. A method of proportioning structural members such that the computed forces produced in the members by *factored loads* do not exceed the member design strength [also called “*load and resistance factor design*” (LRFD)]. The term “strength design” is used in the design of concrete and *masonry* structural elements.

STRUCTURAL COMPOSITE LUMBER. Structural member manufactured using wood elements bonded together with exterior adhesives. Examples of structural composite lumber are:

Laminated strand lumber (LSL). A composite of wood strand elements with wood fibers primarily oriented along the length of the member, where the least dimension of the wood strand elements is 0.10 inch (2.54 mm) or less and their average lengths not less than 150 times the least dimension of the wood strand elements.

Laminated veneer lumber (LVL). A composite of wood *veneer* sheet elements with wood fibers primarily oriented along the length of the member, where the *veneer* element thicknesses are 0.25 inches (6.4 mm) or less.

Oriented strand lumber (OSL). A composite of wood strand elements with wood fibers primarily oriented along the length of the member, where the least dimension of the wood strand elements is 0.10 inches (2.54 mm) or less and their average lengths not less than 75 times and less than 150 times the least dimension of the strand elements.

Parallel strand lumber (PSL). A composite of wood strand elements with wood fibers primarily oriented along the length of the member where the least dimension of the wood strand elements is 0.25 inches (6.4 mm) or less and their average lengths not less than 300 times the least dimension of the wood strand elements.

STRUCTURAL GLUED-LAMINATED TIMBER. An engineered, stress-rated product of a timber laminating plant, comprised of assemblies of specially selected and prepared wood laminations in which the grain of all laminations is approximately parallel longitudinally and the laminations are bonded with adhesives.

STRUCTURAL OBSERVATION. The visual observation of the structural system by a *registered design professional* for general conformance to the *approved construction documents*.

STRUCTURE. That which is built or constructed.

SUBSTANTIAL DAMAGE. Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

SUBSTANTIAL IMPROVEMENT. Any *repair*, reconstruction, rehabilitation, *alteration*, *addition* or other improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the improvement or repair is started. If the structure has sustained *substantial damage*, any *repairs* are

considered substantial improvement regardless of the actual *repair* work performed. The term does not, however, include either:

1. Any project for improvement of a building required to correct existing health, sanitary or safety code violations identified by the *building official* and that are the minimum necessary to assure safe living conditions.
2. Any *alteration* of a historic structure provided that the *alteration* will not preclude the structure's continued designation as a historic structure.

SUBSTANTIAL STRUCTURAL DAMAGE. A condition where one or both of the following apply:

1. The vertical elements of the lateral force-resisting system have suffered damage such that the lateral load-carrying capacity of any *story* in any horizontal direction has been reduced by more than 33 percent from its predamage condition.
2. The capacity of any vertical component carrying gravity load, or any group of such components, that supports more than 30 percent of the total area of the structure's floors and roofs has been reduced more than 20 percent from its predamage condition and the remaining capacity of such affected elements, with respect to all dead and *live loads*, is less than 75 percent of that required by this code for new buildings of similar structure, purpose and location.

SUNROOM. A one-story structure attached to a building with a glazing area in excess of 40 percent of the gross area of the structure's *exterior walls* and roof.

SUPERVISING STATION. A facility that receives signals and at which personnel are in attendance at all times to respond to these signals.

SUPERVISORY SERVICE. The service required to monitor performance of guard tours and the operative condition of fixed suppression systems or other systems for the protection of life and property.

SUPERVISORY SIGNAL. A signal indicating the need of action in connection with the supervision of guard tours, the fire suppression systems or equipment or the maintenance features of related systems.

SUPERVISORY SIGNAL-INITIATING DEVICE. An initiation device, such as a valve supervisory switch, water-level indicator or low-air pressure switch on a dry-pipe sprinkler system, whose change of state signals an off-normal condition and its restoration to normal of a fire protection or life safety system, or a need for action in connection with guard tours, fire suppression systems or equipment or maintenance features of related systems.

SUSCEPTIBLE BAY. A roof or portion thereof with:

1. A slope less than $\frac{1}{4}$ -inch per foot (0.0208 rad); or
2. On which water is impounded, in whole or in part, and the secondary drainage system is functional but the primary drainage system is blocked.

A roof surface with a slope of $\frac{1}{4}$ -inch per foot (0.0208 rad) or greater towards points of free drainage is not a susceptible bay.

SWIMMING POOL. Any structure intended for swimming, recreational bathing or wading that contains water over 24 inches (610 mm) deep. This includes in-ground, above-ground and on-ground pools; hot tubs; spas and fixed-in-place wading pools.

T RATING. The time period that the *penetration firestop system*, including the penetrating item, limits the maximum temperature rise to 325°F (163°C) above its initial temperature through the penetration on the nonfire side when tested in accordance with ASTM E814 or UL 1479.

TECHNICAL PRODUCTION AREA. Open elevated areas or spaces intended for entertainment technicians to walk on and occupy for servicing and operating entertainment technology systems and equipment. Galleries, including fly and lighting galleries, gridirons, catwalks, and similar areas are designed for these purposes.

TENSILE MEMBRANE STRUCTURE. A membrane structure having a shape that is determined by tension in the membrane and the geometry of the support structure. Typically, the structure consists of both flexible elements (e.g., membrane and cables), nonflexible elements (e.g., struts, masts, beams and arches) and the anchorage (e.g., supports and foundations). This includes frame-supported tensile membrane structures.

TENT. A structure, enclosure or shelter, with or without sidewalls or drops, constructed of fabric or pliable material supported in any manner except by air or the contents it protects.

THERMAL ISOLATION. A separation of conditioned spaces, between a *sunroom* and a *dwelling unit*, consisting of existing or new walls, doors or windows.

THERMOPLASTIC MATERIAL. A plastic material that is capable of being repeatedly softened by increase of temperature and hardened by decrease of temperature.

THERMOSETTING MATERIAL. A plastic material that is capable of being changed into a substantially nonreformable product when cured.

THROUGH PENETRATION. A breach in both sides of a floor, floor-ceiling or wall assembly to accommodate an item passing through the breaches.

THROUGH-PENETRATION FIRESTOP SYSTEM. An assemblage consisting of a fire-resistance-rated floor, floor-ceiling, or wall assembly, one or more penetrating items passing through the breaches in both sides of the assembly and the materials or devices, or both, installed to resist the spread of fire through the assembly for a prescribed period of time.

TIE-DOWN (HOLD-DOWN). A device used to resist uplift of the chords of *shear walls*.

TIE, WALL. Metal connector that connects *wythes* of *masonry* walls together.

TILE, STRUCTURAL CLAY. A hollow *masonry unit* composed of burned clay, shale, fire clay or mixture thereof, and having parallel *cells*.

DEFINITIONS

TIRES, BULK STORAGE OF. Storage of tires where the area available for storage exceeds 20,000 cubic feet (566 m³).

TOWNHOUSE. A single-family *dwelling unit* constructed in a group of three or more attached units in which each unit extends from the foundation to roof and with open space on at least two sides.

TOXIC. A chemical falling within any of the following categories:

1. A chemical that has a median lethal dose (LD₅₀) of more than 50 milligrams per kilogram, but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
2. A chemical that has a median lethal dose (LD₅₀) of more than 200 milligrams per kilogram, but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kilograms each.
3. A chemical that has a median lethal concentration (LC₅₀) in air of more than 200 parts per million, but not more than 2,000 parts per million by volume of gas or vapor, or more than 2 milligrams per liter but not more than 20 milligrams per liter of mist, fume or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

TRANSIENT. Occupancy of a *dwelling unit* or *sleeping unit* for not more than 30 days.

TRANSIENT AIRCRAFT. Aircraft based at another location and that is at the transient location for not more than 90 days.

TREATED WOOD. Wood products that are conditioned to enhance fire-retardant or preservative properties.

Fire-retardant-treated wood. Wood products that, when impregnated with chemicals by a pressure process or other means during manufacture, exhibit reduced surface-burning characteristics and resist propagation of fire.

Preservative-treated wood. Wood products that, conditioned with chemicals by a pressure process or other means, exhibit reduced susceptibility to damage by fungi, insects or marine borers.

TRIM. Picture molds, chair rails, baseboards, *handrails*, door and window frames and similar decorative or protective materials used in fixed applications.

TROUBLE SIGNAL. A signal initiated by the *fire alarm system* or device indicative of a fault in a monitored circuit or component.

TUBULAR DAYLIGHTING DEVICE (TDD). A non-operable *fenestration* unit primarily designed to transmit daylight from a roof surface to an interior ceiling via a tubular conduit. The basic unit consists of an exterior glazed weathering surface, a light-transmitting tube with a reflective interior surface, and an interior-sealing device such as a translucent

ceiling panel. The unit can be factory assembled, or field-assembled from a manufactured kit.

24-HOUR BASIS. See “24-hour basis” located preceding “AAC masonry.”

TYPE A UNIT. A *dwelling unit* or *sleeping unit* designed and constructed for accessibility in accordance with this code and the provisions for *Type A units* in ICC A117.1.

TYPE B UNIT. A *dwelling unit* or *sleeping unit* designed and constructed for accessibility in accordance with this code and the provisions for *Type B units* in ICC A117.1, consistent with the design and construction requirements of the federal Fair Housing Act.

UNDERLAYMENT. One or more layers of felt, sheathing paper, nonbituminous saturated felt or other *approved* material over which a steep-slope *roof covering* is applied.

UNIT SKYLIGHT. See “Skylight, unit.”

UNSTABLE (REACTIVE) MATERIAL. A material, other than an explosive, which in the pure state or as commercially produced, will vigorously polymerize, decompose, condense or become self-reactive and undergo other violent chemical changes, including *explosion*, when exposed to heat, friction or shock, or in the absence of an inhibitor, or in the presence of contaminants, or in contact with *incompatible materials*. Unstable (reactive) materials are subdivided as follows:

Class 4. Materials that in themselves are readily capable of *detonation* or explosive decomposition or explosive reaction at *normal temperatures and pressures*. This class includes materials that are sensitive to mechanical or localized thermal shock at *normal temperatures and pressures*.

Class 3. Materials that in themselves are capable of *detonation* or of explosive decomposition or explosive reaction but which require a strong initiating source or which must be heated under confinement before initiation. This class includes materials that are sensitive to thermal or mechanical shock at elevated temperatures and pressures.

Class 2. Materials that in themselves are normally unstable and readily undergo violent chemical change but do not detonate. This class includes materials that can undergo chemical change with rapid release of energy at *normal temperatures and pressures*, and that can undergo violent chemical change at elevated temperatures and pressures.

Class 1. Materials that in themselves are normally stable but which can become unstable at elevated temperatures and pressure.

USE (MATERIAL). Placing a material into action, including *solids*, *liquids* and *gases*.

VAPOR PERMEABLE MEMBRANE. The property of having a moisture vapor permeance rating of 5 perms (2.9 × 10⁻¹⁰ kg/Pa × s × m²) or greater, when tested in accordance with the desiccant method using Procedure A of ASTM E96. A vapor permeable material permits the passage of moisture vapor.

VAPOR RETARDER CLASS. A measure of a material or assembly’s ability to limit the amount of moisture that passes

through that material or assembly. Vapor retarder class shall be defined using the desiccant method of ASTM E96 as follows:

Class I: 0.1 perm or less.

Class II: $0.1 < \text{perm} \leq 1.0$ perm.

Class III: $1.0 < \text{perm} \leq 10$ perm.

VEGETATIVE ROOF. An assembly of interacting components designed to waterproof and normally insulate a building's top surface that includes, by design, vegetation and related landscape elements.

VEHICLE BARRIER. A component or a system of components, near open sides or walls of garage floors or ramps that act as a restraint for vehicles.

VEHICULAR GATE. A gate that is intended for use at a vehicular entrance or exit to a facility, building or portion thereof, and that is not intended for use by pedestrian traffic.

VENEER. A facing attached to a wall for the purpose of providing ornamentation, protection or insulation, but not counted as adding strength to the wall.

VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

VINYL SIDING. A shaped material, made principally from rigid polyvinyl chloride (PVC), that is used as an *exterior wall covering*.

VISIBLE ALARM NOTIFICATION APPLIANCE. A notification appliance that alerts by the sense of sight.

WALKWAY, PEDESTRIAN. A walkway used exclusively as a pedestrian trafficway.

WALL (for Chapter 21). A vertical element with a horizontal length-to-thickness ratio greater than three, used to enclose space.

Cavity wall. A wall built of *masonry units* or of concrete, or a combination of these materials, arranged to provide an airspace within the wall, and in which the inner and outer parts of the wall are tied together with metal ties.

Dry-stacked, surface-bonded wall. A wall built of concrete *masonry units* where the units are stacked dry, without *mortar* on the bed or *head joints*, and where both sides of the wall are coated with a surface-bonding *mortar*.

Parapet wall. The part of any wall entirely above the roof line.

WALL, LOAD-BEARING. Any wall meeting either of the following classifications:

1. Any metal or wood stud wall that supports more than 100 pounds per linear foot (1459 N/m) of vertical load in addition to its own weight.
2. Any *masonry* or concrete, or mass timber wall that supports more than 200 pounds per linear foot (2919 N/m) of vertical load in addition to its own weight.

WALL, NONLOAD-BEARING. Any wall that is not a *load-bearing wall*.

WATER-REACTIVE MATERIAL. A material that explodes; violently reacts; produces *flammable*, *toxic* or other hazardous gases; or evolves enough heat to cause autoignition or ignition of combustibles upon exposure to water or moisture. Water-reactive materials are subdivided as follows:

Class 3. Materials that react explosively with water without requiring heat or confinement.

Class 2. Materials that react violently with water or have the ability to boil water. Materials that produce *flammable*, *toxic* or other hazardous gases or evolve enough heat to cause autoignition or ignition of combustibles upon exposure to water or moisture.

Class 1. Materials that react with water with some release of energy, but not violently.

WATER-RESISTIVE BARRIER. A material behind an *exterior wall covering* that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the *exterior wall assembly*.

WEATHER-EXPOSED SURFACES. Surfaces of walls, ceilings, floors, roofs, soffits and similar surfaces exposed to the weather except the following:

1. Ceilings and roof soffits enclosed by walls, fascia, bulkheads or beams that extend not less than 12 inches (305 mm) below such ceiling or roof soffits.
2. Walls or portions of walls beneath an unenclosed roof area, where located a horizontal distance from an open exterior opening equal to not less than twice the height of the opening.
3. Ceiling and roof soffits located a minimum horizontal distance of 10 feet (3048 mm) from the outer edges of the ceiling or roof soffits.

WET-CHEMICAL EXTINGUISHING SYSTEM. A solution of water and potassium-carbonate-based chemical, potassium-acetate-based chemical or a combination thereof, forming an extinguishing agent.

WHEELCHAIR SPACE. A space for a single wheelchair and its occupant.

WIND-BORNE DEBRIS REGION. Areas within hurricane-prone regions located:

1. Within 1 mile (1.61 km) of the coastal mean high water line where the ultimate design wind speed, V_{ult} , is 130 mph (58 m/s) or greater; or
2. In areas where the ultimate design wind speed is 140 mph (63.6 m/s) or greater.

For *Risk Category II* buildings and structures and *Risk Category III* buildings and structures, except health care facilities, the wind-borne debris region shall be based on Figure 1609.3.(1). For *Risk Category IV* buildings and structures and *Risk Category III* health care facilities, the wind-borne debris region shall be based on Figure 1609.3.(2).

WINDFORCE-RESISTING SYSTEM, MAIN. See "Main windforce-resisting system."

WIND SPEED, V_{ult} . Ultimate design wind speeds.

WIND SPEED, V_{asd} . Nominal design wind speeds.

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WINDER. A tread with nonparallel edges.

WIRE BACKING. Horizontal strands of tautened wire attached to surfaces of vertical supports which, when covered with the building paper, provide a *backing* for cement plaster.

WIRELESS PROTECTION SYSTEM. A system or a part of a system that can transmit and receive signals without the aid of wire.

WOOD/PLASTIC COMPOSITE. A composite material made primarily from wood or cellulose-based materials and plastic.

WOOD SHEAR PANEL. A wood floor, roof or wall component sheathed to act as a *shear wall* or *diaphragm*.

WOOD STRUCTURAL PANEL. A panel manufactured from *veneers*, wood strands or wafers or a combination of *veneer* and wood strands or wafers bonded together with waterproof synthetic resins or other suitable bonding systems. Examples of wood structural panels are:

Composite panels. A wood structural panel that is comprised of wood *veneer* and reconstituted wood-based material and bonded together with waterproof adhesive;

Oriented strand board (OSB). A mat-formed wood structural panel comprised of thin rectangular wood strands arranged in cross-aligned layers with surface layers normally arranged in the long panel direction and bonded with waterproof adhesive; or

Plywood. A wood structural panel comprised of plies of wood *veneer* arranged in cross-aligned layers. The plies are bonded with waterproof adhesive that cures on application of heat and pressure.

WORKSTATION. A defined space or an independent principal piece of equipment using *HPM* within a *fabrication area* where a specific function, laboratory procedure or research activity occurs. *Approved* or *listed hazardous materials storage cabinets*, *flammable liquid storage cabinets* or *gas cabinets* serving a workstation are included as part of the workstation. A workstation is allowed to contain *ventilation* equipment, fire protection devices, detection devices, electrical devices and other processing and scientific equipment.

WYTHE. Each continuous, vertical section of a wall, one *masonry unit* in thickness.

YARD. An open space, other than a *court*, unobstructed from the ground to the sky, except where specifically provided by this code, on the lot on which a building is situated.

ZONE. A defined area within the protected premises. A zone can define an area from which a signal can be received, an area to which a signal can be sent or an area in which a form of control can be executed.

ZONE, NOTIFICATION. An area within a building or facility covered by notification appliances which are activated simultaneously.

202.2 New definitions. The following new terms and definitions are added to Section 202 of the *Building Code*.

ACCESSORY STRUCTURE (for Appendix G). A structure that is:

1. Not used for human habitation.
2. Incidental to a main structure on the premises.
3. Used only for the parking of vehicles or limited storage.

ADDRESS NUMBER (for Section 118). A number used to provide specific identification for a *lot* on a *public thoroughfare* or *private thoroughfare* in the District of Columbia, which may be a *primary address* or a *secondary address*. It shall be stored as a numeric value and may include an *address number suffix*.

ADDRESS NUMBER RANGE (for Section 118). The high and low values for the *street numbers* found on a block face. The address range is expressed as a low number and a high number representing the lowest and highest *street numbers* found or possible on a given *block face*.

ADDRESS NUMBER SUFFIX (for Section 118). A fraction or a letter that is attached to an *address number* in an address.

ADMINISTRATIVE BULLETINS. Notices issued by the *Department* that represent official *Department* policies to assist applicants, staff and the public in following operational, technical and legal procedures.

ALLEY. Each public thoroughfare or private thoroughfare which is not a street.

ALLEY LINE EXTENDED (for Chapter 32). A line through the corner of a *lot*, at the intersection of an alley with the *street*, and perpendicular to the *street*.

ALTERATION OF A WATERCOURSE. A dam, impoundment, channel relocation, change in channel alignment, channelization, or change in cross-sectional area of the channel or the channel capacity, or any other form of modification which may alter, impede, retard or change the direction and/or velocity of the riverine flow of water during conditions of the base flood.

ASSISTIVE LISTENING SYSTEM. An amplification system utilizing transmitters, receivers, and coupling devices to bypass the acoustical space between a sound source and a listener by means of induction loop, radio frequency, infrared or direct-wired equipment.

BAY WINDOW. A *structure* with windows that projects from the façade of a *building*, starts at or below grade, and is not intended for the display of merchandise or services.

BLOCK FACE (for Section 118). The right-of-way line along a public street or the property line at the edge of a private street segment. Each *street segment* shall have two *block faces*.

BOARD OF ZONING ADJUSTMENT (BZA). The *Board of Zoning Adjustment* (BZA) is an independent, quasi-judicial body that is empowered to grant relief from the strict application of the *Zoning Regulations* (variances), approve certain uses of land (special exceptions), and hear appeals of actions taken by the *Zoning Administrator*.

BUILDING RESTRICTION AREA. The portion of a *lot* between a *building restriction line* and a *lot line* adjoining a *street*.

BUILDING RESTRICTION LINE. A line that defines a required set-back on a lot, a certain distance from the *public right-of-way*, that is recorded on the records of the Surveyor of the District of Columbia. Any area between a *lot line* adjoining a *street* and the *building restriction line* is private property set aside and treated as *public space*.

BUSINESS DAY. A day other than Saturday, Sunday, or a legal public holiday in the District of Columbia. If *business day* is not specified, a day shall mean a calendar day.

CODE OFFICIAL. The *Director* of the District of Columbia Department of Consumer and Regulatory Affairs, or a duly authorized representative, for administration and enforcement of the *Construction Codes*, including *Fire Code* provisions pertaining to approval, installation, design, testing, and inspection of new fire protection systems and the modification of existing fire protection systems. References in the *Fire Code* to the *code official* shall refer to the Fire Chief of the District of Columbia Department of Fire and Emergency Medical Services or a duly authorized representative, except where the *Fire Code* provision pertains to approval, installation, design, testing, and inspection of new fire protection systems and the modification of existing fire protection systems. The *Fire Chief* shall be the *code official* for maintenance, testing and inspection of all existing fire protection systems.

COLONNADE. A series of columns placed at regular intervals that supports a *structure* above.

CONDOMINIUM LOT (for Section 118). A condominium unit created through the establishment of a condominium regime pursuant to the District of Columbia Condominium Act of 1980, as amended (Title 42 DC Official Code, Chapter 34) where the condominium unit fronts on and can be accessed directly from an adjacent *public thoroughfare* or *private thoroughfare*.

CONSTRUCTION CODES. The 2017 *District of Columbia Construction Codes* as defined in Chapter 1 of the *Building Code*.

CONSTRUCTION CODES ACT. The Construction Codes Approval and Amendments Act of 1986, effective March 21, 1987 [DC Law 6-216; DC Official Code §§ 6-1401 et seq. (2018 Repl.)] including any subsequent amendments thereto.

DEMOLITION.

Interior demolition. Work that involves the removal of interior nonbearing walls, elements or systems, or interior finishes.

Partial demolition. Work of a greater scope than *demolition interior* that includes the removal of structural elements (interior or exterior), exterior walls, roofs, or other exterior elements but is not a *raze*.

DEPARTMENT. The District of Columbia Department of Consumer and Regulatory Affairs, except that references to *Department* in the *Fire Code* shall refer to the District of Columbia Fire and Emergency Medical Services Department.

DEVELOPMENT (for Section 1612 and Appendix G). Any man-made change to improved or unimproved *premises*, including but not limited to, buildings or other structures, temporary structures, temporary or permanent storage of materials, mining, dredging, filling, grading, paving, excavations, operations and other land-disturbing activities.

DEVELOPMENT SITE (for Section 1612 and Appendix G). A *record lot* wholly or partially within a *flood hazard area* on which any *development* is proposed to occur.

ELEVATION CERTIFICATE. The National Flood Insurance Program (NFIP) Elevation Certificate (FEMA form 086-0-33), any successor to FEMA form 086-0-33, or other approved form, used to certify that new buildings and substantial improvements in *Flood Hazard Areas* are properly elevated in accordance with the *Floodplain Management Regulations of the District of Columbia*.

EMBELLISHMENT. An architectural element that ornaments and articulates the façade of a *building*.

ENCROACHMENT (for Appendix G). The placement of fill, excavation, buildings, permanent structures or other development into a flood hazard area which may impede or alter the flow capacity of riverine *flood hazard areas*.

EXISTING BUILDING. Any *building* that has been erected and legally occupied (excluding buildings occupied pursuant to a temporary certificate of occupancy).

FIRE CHIEF. The Chief of the DC Fire and Emergency Medical Services Department.

FLOOD HAZARD AREA. The area designated as a *flood hazard area* in 20 DCMR, Chapter 31.

FLOODPLAIN ADMINISTRATOR. The Director of the District of Columbia Department of Energy & Environment (DOEE).

FLOODPLAIN MANAGEMENT REGULATIONS OF THE DISTRICT OF COLUMBIA. The flood-resistant construction provisions of the *Construction Codes* in combination with the flood resilience rules promulgated by the Department of Energy and the Environment (DOEE), set forth in Title 20, Chapter 31 of the DCMR, and in Title 6, Chapter 5 of the DC Official Code (2018 Repl.).

FLOODPROOFING CERTIFICATE. The National Flood Insurance Program Floodproofing Certificate (FEMA form 086-0-34), any successor to FEMA form 086-0-34, or other *approved* form, used to certify a floodproofing design for nonresidential buildings that are permitted as an alternative to elevating to or above the *Base Flood Elevation*.

FUNCTIONALLY DEPENDENT FACILITY (for Appendix G). A facility that cannot be used for its intended purpose unless it is located or carried out in close proximity to water, such as a docking or port facility necessary for the loading or unloading of cargo or passengers, shipbuilding or ship repair. The term does not include long-term storage, manufacture, sales or service facilities.

HISTORIC STRUCTURE (for Appendix G). Any structure that is: (a) individually listed in the National Register of Historic Places (a listing maintained by the U.S. Department of Interior) or preliminarily determined by the Secretary of

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the Interior as meeting the requirements for individual listing on the National Register; (b) certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district; (c) individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior, such as the DC Register of Historic Places; or (d) individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either: (i) by an approved state program as determined by the Secretary of the Interior; or (ii) directly by the Secretary of the Interior in states without approved programs.

LETTER OF MAP CHANGE. An official determination issued by the Federal Emergency Management Agency (FEMA) that amends or revises an effective Flood Insurance Rate Map or Flood Insurance Study. Letters of Map Change include:

1. **Letter of Map Amendment (LOMA):** An amendment based on technical data showing that a property was incorrectly included in a designated special flood hazard area. A LOMA amends the current effective Flood Insurance Rate Map and establishes that a specific property, portion of a property, or structure is not located in a special flood hazard area.
2. **Letter of Map Revision (LOMR):** A revision based on technical data that may show changes to flood zones, flood elevations, special flood hazard area boundaries and floodway delineations, and other planimetric features.
3. **Letter of Map Revision Based on Fill (LOMR-F):** A determination that a structure or parcel of land has been elevated by fill above the base flood elevation and is, therefore, no longer located within the special flood hazard area. In order to qualify for this determination, the fill must have been permitted and placed in accordance with the community's floodplain management regulations.
4. **Conditional Letter of Map Revision (CLOMR):** A formal review and comment as to whether a proposed flood protection project or other project complies with the minimum NFIP requirements for such projects with respect to delineation of special flood hazard areas. A CLOMR does not revise the effective Flood Insurance Rate Map or Flood Insurance Study; upon submission and approval of certified as-built documentation, a Letter of Map Revision may be issued by FEMA to revise the effective FIRM.

LOT (for Section 118). A parcel of land, being either (a) a *record lot*, (b) a *Condominium Lot*, or (c) a *Tax Lot*.

LOT LINE EXTENDED (for Chapter 32). The extension of a *lot line* through a corner of the lot that adjoins the *street*, perpendicular to the street.

MAIN ENTRANCE (for Section 118). The principal point of entry into a *building* or other *structure* on a *lot* from a *pub-*

lic thoroughfare or *private thoroughfare*; provided that where, due to the physical configuration of a *building* or other *structure*, it would be appropriate for reasons of public safety or public convenience for a *building* or other *structure* to have more than one point of entry from a *thoroughfare* be recognized as a *main entrance* of that *building* or other *structure*, then the *code official* is authorized to recognize more than one entry point to that *building* or other *structure* as a *main entrance* and to assign a distinct *address number* for display by means of a suffix or other designation as the *code official* deems appropriate.

MANUFACTURED HOME (for Appendix G). A structure that is transportable in one or more sections, built on a permanent chassis, designed for use with or without a permanent foundation when attached to the required utilities, and constructed to the Federal Mobile Home Construction and Safety Standards and rules and regulations promulgated by the US Department of Housing and Urban Development. The term also includes mobile homes, park trailers, travel trailers and similar transportable structures that are placed on a site for 180 consecutive days or longer.

MANUFACTURED HOME PARK OR SUBDIVISION (for Appendix G). A *record lot* divided into two or more manufactured home lots for rent or sale.

MARKET VALUE (for Appendix G). The assessed value of the building or structure, as established by the District of Columbia Office of Tax and Revenue, Real Property Tax Administration (OTR). The assessed value of the land on which the building or structure is located shall not be included in the determination. The relevant assessment shall be the OTR assessment promulgated before the damage occurred or before the repair or improvement is started.

MASS TIMBER. Structural elements of Type IV construction primarily of solid, built-up, panelized or engineered wood products that meet minimum cross section dimensions of Type IV construction.

MAUSOLEUM. A permanent structure or building, located on burial grounds authorized pursuant to DC Official Code § 43-121, which is substantially exposed above the ground and used solely for the interment, entombment, or inurnment of human remains.

NONCOMBUSTIBLE PROTECTION (FOR MASS TIMBER). Noncombustible material, in accordance with Section 703.5, designed to increase the fire-resistance rating and delay the combustion of mass timber.

OFFICE OF ADMINISTRATIVE HEARINGS (OAH). An independent agency within the executive branch of the District of Columbia government, established by the Office of Administrative Hearings Establishment Act of 2001 effective March 6, 2002 [DC Law 14-76; DC Official Code §§ 2-1831.01 *et seq.* (2016 Repl. & 2018 Supp.)], as an administrative tribunal and agency to hear certain contested cases and other administrative adjudication cases arising under the laws of the District of Columbia.

ORIEL WINDOW. A *structure* with windows that project from the façade of a *building*, do not touch grade, and are not intended for the display of merchandise or services.

PARTY LINE. A *lot line* shared by adjoining *lots*.

PARTY LINE EXTENDED (for Chapter 32). The extension of a *party line* that adjoins the *street*, and perpendicular to the *street*.

PARTY WALL (for Chapters 1 and 33). A wall that straddles, or is in close proximity to, a *lot line*, which is used for structural support by two or more adjoining *buildings* or *structures*.

PORCH (for Chapter 32). An above-grade *structure* with or without a roof that is open on all sides of the *projection* that are over the *lot line* or *building restriction line*, has vertical elements connecting the floor with a roof, is attached to a *building*, and is accessible from the attached *building*.

PORTE-COCHERE. A covered entrance of sufficient size for a vehicle to pass underneath and provide shelter from the weather.

PREMISES. A lot, plot or parcel of land, including any *buildings* or *structures* thereon, or a part of a lot, plot, parcel of land or *structure*.

PRIMARY ADDRESS (for Section 118). The address of the main entrance of a *premises*.

PRIVATE THOROUGHFARE (for Section 118). Streets, alleys and other *thoroughfares* where the underlying land is owned by private citizens or entities, or is part of existing tax or record lots adjoining a *public thoroughfare*.

PROJECTION (for Chapter 32). An encroachment into the *public right of way*, *public space* or a *building restriction area*.

PUBLIC PARKING. The area of a *street* devoted to open space, greenery, or parks which lies between the *lot line* and the edge of the actual or planned sidewalk which is nearer to the *lot line*, as such *lot line* and sidewalk are shown on the records of the District of Columbia.

PUBLIC RIGHT-OF-WAY. The surface, the air space above the surface, and the area below the surface of any *public space*.

PUBLIC SPACE. All the publicly owned property between *lot lines*, including *streets*, *alleys*, parks, and reservations. Any *building restriction area*, where the same exists on a *lot*, shall be treated as *public space*.

PUBLIC THOROUGHFARE (for Section 118). Streets, alleys and other *thoroughfares* that are under the jurisdiction of the District of Columbia, any other public government, including the Federal Government or its branches, or by any adjoining state government.

RAZE. The complete removal of any existing structure, with or without the removal of party walls and below grade portions of a structure.

RECORD LOT (for Section 118). A lot of record created pursuant to the Subdivision Regulations of the District of Columbia, 10-B DCMR §§ 2700 *et seq.*

RECREATIONAL VEHICLE (for Appendix G). A vehicle that is built on a single chassis, 400 square feet (37.16 m²) or less when measured at the largest horizontal projection, designed to be self-propelled or permanently towable by a

light-duty truck, and designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel or seasonal use. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect-type utilities and security devices and has no permanently attached additions.

RENTAL UNIT. Any *premises* or part of a *premises* which is rented or offered for rent for residential (nontransient) occupancy, including, but not limited to, an apartment, *dwelling unit*, *rooming unit*, *sleeping unit*, *housekeeping unit* or *dwelling*.

SECONDARY ADDRESS (for Section 118). An address created when a *building* has an entrance from the exterior, other than the *main entrance*, that directly serves a tenant different than that served by the main entrance.

SHOW WINDOW (for Chapter 32). A *structure* with windows that projects from the façade of a *building*, starts at grade, and is intended for the display of merchandise or services.

SIGN LEGISLATION. Any District of Columbia laws and regulations, including, but not limited to, An Act To regulate the erection, hanging, placing, painting, display, and maintenance of outdoor signs and other forms of exterior advertising within the District of Columbia, approved March 3, 1931 [46 Stat. 1486; DC Official Code Section §§ 1-303.21 *et seq.* (2016 Repl. & 2018 Supp.)], as amended, and any substantially similar successor legislation, and Mayor's Order 2011-181, dated October 31, 2011.

SPECIAL INSPECTION POLICY MANUAL. The document setting forth policies and procedures associated with providing special inspection services pursuant to Chapter 17 of the *District of Columbia Building Code* (October 15, 2018 edition, as may be amended from time to time by the *Department*).

STATE HISTORIC PRESERVATION OFFICER. The person designated by the Mayor to administer the National Register Program within the District of Columbia established pursuant to the National Historic Preservation Act of 1966 (16 USC §§ 470 *et seq.*).

STREET (for Chapter 32). A *public thoroughfare*, other than an *alley*, as shown on the records of the District of Columbia, including any associated roadway, curb, sidewalk, tree space and *public parking*.

TAX LOT (for Section 118). An assessment and taxation lot, and, established by the Office of Tax and Revenue of the District of Columbia as a "ground lot" (*i.e.* 800, 900 or 1000 series lots), which fronts on and can be accessed directly from an adjacent *public thoroughfare* or *private thoroughfare*.

TERRACE (for Chapter 32). Raised level ground that is located in the *public parking* and is surrounded by a retaining wall or is surrounded by sloped surfaces that transition to adjacent areas.

THIRD-PARTY AGENCY. A *person* retained by an applicant or permit holder to provide code compliance plan reviews or inspections of a project, at the expense of the applicant or the permit holder as applicable, in accordance

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with the procedures set forth in the *Construction Codes* and the *Third Party Program Procedure Manual*.

THIRD-PARTY PROGRAM. A program established by the *Department* to establish and review qualifications of *persons* for approval to provide code compliance plan reviews and inspections of projects, and to provide oversight of *approved third-party agencies*.

THIRD-PARTY PROGRAM PROCEDURE MANUAL.

The document setting forth policies and procedures for the *Department's Third-Party Program* (adopted November 6, 2017, revised December 7, 2018, as may be amended from time to time by the *Department*), including information regarding the qualifications that must be demonstrated for a *person* to obtain approval by the *Department* to conduct code compliance plan reviews or inspections of a project, and the procedures that must be followed as a condition of such approval, pursuant to Sections 6-1405.02 and 6-1405.04 of Title 6 of the DC Official Code (2018 Repl.) and Chapter 17 of this code.

THOROUGHFARE (for Section 118). A *public thoroughfare* or a *private thoroughfare*, as applicable.

THOROUGHFARE NAME (for Section 118). The full proper name of a *thoroughfare*, stored as an alphanumeric character string, the *thoroughfare type* and the *street quadrant*.

THOROUGHFARE NUMBER (for Section 118). A number used to provide specific identification for a *premises* on a public or private thoroughfare in the District of Columbia, which may be a *primary address* or a *secondary address*. It shall be stored as a numeric value.

THOROUGHFARE QUADRANT (for Section 118). Two alphabetical characters that identify the geographic sector of the District of Columbia in which the address is located. All addresses in Washington, DC, with the exception of the United States Capitol which is the central point of the addressing grid, shall have a *thoroughfare quadrant* designation. The *thoroughfare quadrants* are NE (Northeast), NW (Northwest), SE (Southeast) and SW (Southwest), and each quadrant shall be so abbreviated and capitalized. No *thoroughfare quadrant* shall consist of a single cardinal direction (for example, North).

THOROUGHFARE SEGMENT (for Section 118). The portion of a *public thoroughfare* or *private thoroughfare* between its intersections with two other *thoroughfares*.

THOROUGHFARE TYPE (for Section 118). The name of the type of *thoroughfare*, such as avenue, street, road, circle, etc. It shall be stored in fully spelled out form as an alphabetical string. *Thoroughfare types* are listed in the US Postal Service Standards and in the National Emergency Number Association Standards (NENA). The *code official* is authorized to use *thoroughfare types* not listed in either standard.

TOWER (for Chapter 32). A *structure* that projects from the façade of the *building* and extends above the roofline of the building to which it is attached.

UNDERGROUND GARAGE (for Section G105, Appendix G). An enclosed area below the *design flood elevation* or

base flood elevation that will be used solely for parking, building access, or storage.

UNIT NUMBER (for Section 118). The designation of an individual unit, such as “A,” “Rear” or “102.” It shall be stored as an alphanumeric string.

UNIT TYPE (for Section 118). The type of occupancy, such as an apartment, suite, or office space. It shall be stored as an alphabetic string.

VAULT (for Chapter 32). A structure with a roof, completely below-grade, that encloses space.

ZONES, COMMERCIAL. ARTS-1 through ARTS-4, CG-2, CG-3, D-3 through D-8, MU-3 through MU-9, MU-17 through MU-21, MU-24 through MU-28, NC-1 through NC-17, RC-2, RC-3 and USN zoning districts (or the successor thereto) as defined by the *Zoning Regulations*.

ZONES, MIXED-USE. CG-4, HE-1 through HE-4, MU-10, MU-22, MU-29, SEFC-1, StE-1 through StE-19 and WR-2 through WR-5 zoning districts (or the successor thereto) as defined by the *Zoning Regulations*.

ZONES, PRODUCTION, DISTRIBUTION AND REPAIR (PDR). PDR-prefixed zoning districts (or the successors thereto) as defined by the *Zoning Regulations*.

ZONES, RESIDENTIAL. CG-1, D-1-R, RC-1, SEFC-2, SEFC-3, W-1, W-7, W-8 and R, RF or RA-prefixed zoning districts (or the successor thereto) as defined by the *Zoning Regulations*.

ZONE, SPECIAL PURPOSE. D-2, MU-1, MU-2, MU-15, MU-16 or MU-23 zoning districts (or the successor thereto) as defined by the *Zoning Regulations*.

ZONING ADMINISTRATOR. The *Zoning Administrator* of the District of Columbia reviews applications for conformance with the *Zoning Regulations* including applications for permits and certificates.

ZONING REGULATIONS. The regulations adopted through the publication of a notice of final rulemaking published in the *DC Register* on March 2, 2016 and which became effective at 12:01 a.m., September 6, 2016, as those regulations may thereafter be amended. See 11 DCMR.

CHAPTER 3

USE AND OCCUPANCY CLASSIFICATION

SECTION 301 GENERAL

301.1 Scope. The provisions of this chapter shall control the classification of all buildings and structures as to use and occupancy.

SECTION 302 CLASSIFICATION

302.1 General. Structures or portions of structures shall be classified with respect to occupancy in one or more of the groups listed in this section. A room or space that is intended to be occupied at different times for different purposes shall comply with all of the requirements that are applicable to each of the purposes for which the room or space will be occupied. Structures with multiple occupancies or uses shall comply with Section 508. Where a structure is proposed for a purpose that is not specifically provided for in this code, such structure shall be classified in the group that the occupancy most nearly resembles, according to the fire safety and relative hazard involved.

1. Assembly (see Section 303): Groups A-1, A-2, A-3, A-4 and A-5.
2. Business (see Section 304): Group B.
3. Educational (see Section 305): Group E.
4. Factory and Industrial (see Section 306): Groups F-1 and F-2.
5. High Hazard (see Section 307): Groups H-1, H-2, H-3, H-4 and H-5.
6. Institutional (see Section 308): Groups I-1, I-2, I-3 and I-4.
7. Mercantile (see Section 309): Group M.
8. Residential (see Section 310): Groups R-1, R-2, R-3 and R-4.
9. Storage (see Section 311): Groups S-1 and S-2.
10. Utility and Miscellaneous (see Section 312): Group U.

SECTION 303 ASSEMBLY GROUP A

303.1 Assembly Group A. Assembly Group A occupancy includes, among others, the use of a building or structure, or a portion thereof, for the gathering of persons for purposes such as civic, social or religious functions; recreation, food or drink consumption or awaiting transportation.

303.1.1 Small buildings and tenant spaces. A building or tenant space used for assembly purposes with an *occupant load* of less than 50 persons shall be classified as a Group B occupancy.

303.1.2 Small assembly spaces. The following rooms and spaces shall not be classified as Assembly occupancies:

1. A room or space used for assembly purposes with an *occupant load* of less than 50 persons and accessory to another occupancy shall be classified as a Group B occupancy or as part of that occupancy.
2. A room or space used for assembly purposes that is less than 750 square feet (70 m²) in area and accessory to another occupancy shall be classified as a Group B occupancy or as part of that occupancy.

303.1.3 Associated with Group E occupancies. A room or space used for assembly purposes that is associated with a Group E occupancy is not considered a separate occupancy.

303.1.4 Accessory to places of religious worship. Accessory religious educational rooms and religious auditoriums with *occupant loads* of less than 100 per room or space are not considered separate occupancies.

303.2 Assembly Group A-1. Group A-1 occupancy includes assembly uses, usually with fixed seating, intended for the production and viewing of the performing arts or motion pictures including, but not limited to:

Motion picture theaters
Symphony and concert halls
Television and radio studios admitting an audience
Theaters

303.3 Assembly Group A-2. Group A-2 occupancy includes assembly uses intended for food and/or drink consumption including, but not limited to:

Banquet halls
Casinos (gaming areas)
Nightclubs
Restaurants, cafeterias and similar dining facilities
(including associated commercial kitchens)
Taverns and bars

303.4 Assembly Group A-3. Group A-3 occupancy includes assembly uses intended for worship, recreation or amusement and other assembly uses not classified elsewhere in Group A including, but not limited to:

Amusement arcades
Art galleries
Bowling alleys
Community halls
Courtrooms
Dance halls (not including food or drink consumption)
Exhibition halls
Funeral parlors
Gymnasiums (without spectator seating)
Indoor *swimming pools* (without spectator seating)
Indoor tennis courts (without spectator seating)
Lecture halls

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Libraries
Museums
Places of religious worship
Pool and billiard parlors
Waiting areas in transportation terminals

303.5 Assembly Group A-4. Group A-4 occupancy includes assembly uses intended for viewing of indoor sporting events and activities with spectator seating including, but not limited to:

Arenas
Skating rinks
Swimming pools
Tennis courts

303.6 Assembly Group A-5. Group A-5 occupancy includes assembly uses intended for participation in or viewing outdoor activities including, but not limited to:

Amusement park structures
Bleachers
Grandstands
Stadiums

SECTION 304 BUSINESS GROUP B

304.1 Business Group B. Business Group B occupancy includes, among others, the use of a building or structure, or a portion thereof, for office, professional or service-type transactions, including storage of records and accounts. Business occupancies shall include, but not be limited to, the following:

Airport traffic control towers
Ambulatory care facilities
Animal hospitals, kennels and pounds
Banks
Barber and beauty shops
Car wash
Civic administration
Clinic, outpatient
Dry cleaning and laundries: pick-up and delivery stations and self-service
Educational occupancies for students above the 12th grade
Electronic data processing
Food processing establishments and commercial kitchens not associated with restaurants, cafeterias and similar dining facilities not more than 2,500 square feet (232 m²) in area.
Laboratories: testing and research
Motor vehicle showrooms
Post offices
Print shops
Professional services (architects, attorneys, dentists, physicians, engineers, etc.)
Radio and television stations
Telephone exchanges
Training and skill development not in a school or academic program (this shall include, but not be limited to, tutoring centers, martial arts studios, gymnastics and

similar uses regardless of the ages served, and where not classified as a Group A occupancy).

304.2 Definitions. The following terms are defined in Chapter 2:

AMBULATORY CARE FACILITY.

CLINIC, OUTPATIENT.

SECTION 305 EDUCATIONAL GROUP E

305.1 Educational Group E. Educational Group E occupancy includes, among others, the use of a building or structure, or a portion thereof, by six or more persons at any one time for educational purposes through the 12th grade.

305.1.1 Accessory to places of religious worship. Religious educational rooms and religious auditoriums, which are accessory to *places of religious worship* in accordance with Section 303.1.4 and have *occupant loads* of less than 100 per room or space, shall be classified as Group A-3 occupancies.

305.2 Group E, day care facilities. This group includes buildings and structures or portions thereof occupied by more than five children older than 2½ years of age who receive educational, supervision or *personal care services* for fewer than 24 hours per day.

305.2.1 Within places of religious worship. Rooms and spaces within *places of religious worship* providing such day care during religious functions shall be classified as part of the primary occupancy.

305.2.2 Five or fewer children. A facility having five or fewer children receiving such day care shall be classified as part of the primary occupancy.

305.2.3 Five or fewer children in a dwelling unit. A facility such as the above within a *dwelling unit* and having five or fewer children receiving such day care shall be classified as a Group R-3 occupancy or shall comply with the *Residential Code*.

SECTION 306 FACTORY GROUP F

306.1 Factory Industrial Group F. Factory Industrial Group F occupancy includes, among others, the use of a building or structure, or a portion thereof, for assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair or processing operations that are not classified as a Group H hazardous or Group S storage occupancy.

306.2 Moderate-hazard factory industrial, Group F-1. Factory industrial uses that are not classified as Factory Industrial F-2 Low Hazard shall be classified as F-1 Moderate Hazard and shall include, but not be limited to, the following:

Aircraft (manufacturing, not to include repair)
Appliances
Athletic equipment

Automobiles and other motor vehicles
 Bakeries
 Beverages: over 16-percent alcohol content
 Bicycles
 Boats
 Brooms or brushes
 Business machines
 Cameras and photo equipment
 Canvas or similar fabric
 Carpets and rugs (includes cleaning)
 Clothing
 Construction and agricultural machinery
 Disinfectants
 Dry cleaning and dyeing
 Electric generation plants
 Electronics
 Engines (including rebuilding)
 Food processing establishments and commercial kitchens
 not associated with restaurants, cafeterias and similar
 dining facilities more than 2,500 square feet (232 m²) in
 area.
 Furniture
 Hemp products
 Jute products
 Laundries
 Leather products
 Machinery
 Metals
 Millwork (sash and door)
 Motion pictures and television filming (without
 spectators)
 Musical instruments
 Optical goods
 Paper mills or products
 Photographic film
 Plastic products
 Printing or publishing
 Recreational vehicles
 Refuse incineration
 Shoes
 Soaps and detergents
 Textiles
 Tobacco
 Trailers
 Upholstering
 Wood; distillation
 Woodworking (cabinet)

306.3 Low-hazard factory industrial, Group F-2. Factory industrial uses that involve the fabrication or manufacturing of noncombustible materials that during finishing, packing or processing do not involve a significant fire hazard shall be classified as F-2 occupancies and shall include, but not be limited to, the following:

Beverages: up to and including 16-percent alcohol content
 Brick and masonry
 Ceramic products

Foundries
 Glass products
 Gypsum
 Ice
 Metal products (fabrication and assembly)

SECTION 307 HIGH-HAZARD GROUP H

307.1 High-hazard Group H. High-hazard Group H occupancy includes, among others, the use of a building or structure, or a portion thereof, that involves the manufacturing, processing, generation or storage of materials that constitute a physical or health hazard in quantities in excess of those allowed in *control areas* complying with Section 414, based on the maximum allowable quantity limits for *control areas* set forth in Tables 307.1(1) and 307.1(2). Hazardous occupancies are classified in Groups H-1, H-2, H-3, H-4 and H-5 and shall be in accordance with this section, the requirements of Section 415 and the *Fire Code*. Hazardous materials stored, or used on top of roofs or canopies, shall be classified as outdoor storage or use and shall comply with the *Fire Code*.

307.1.1 Uses other than Group H. An occupancy that stores, uses or handles hazardous materials as described in one or more of the following items shall not be classified as Group H, but shall be classified as the occupancy that it most nearly resembles.

1. Buildings and structures occupied for the application of flammable finishes, provided that such buildings or areas conform to the requirements of Section 416 and the *Fire Code*.
2. Wholesale and retail sales and storage of flammable and combustible liquids in mercantile occupancies conforming to the *Fire Code*.
3. Closed piping system containing flammable or combustible liquids or gases utilized for the operation of machinery or equipment.
4. Cleaning establishments that utilize combustible liquid solvents having a flash point of 140°F (60°C) or higher in closed systems employing equipment *listed* by an *approved* testing agency, provided that this occupancy is separated from all other areas of the building by 1-hour *fire barriers* constructed in accordance with Section 707 or 1-hour *horizontal assemblies* constructed in accordance with Section 711, or both.
5. Cleaning establishments that utilize a liquid solvent having a flash point at or above 200°F (93°C).
6. Liquor stores and distributors without bulk storage.
7. Refrigeration systems.

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8. The storage or utilization of materials for agricultural purposes on the premises.
9. Stationary batteries utilized for facility emergency power, uninterruptable power supply or telecommunication facilities, provided that the batteries are provided with safety venting caps and *ventilation* is provided in accordance with the *Mechanical Code*.
10. Corrosive personal or household products in their original packaging used in retail display.
11. Commonly used corrosive building materials.
12. Buildings and structures occupied for aerosol storage shall be classified as Group S-1, provided that such buildings conform to the requirements of the *Fire Code*.
13. Display and storage of nonflammable solid and nonflammable or noncombustible liquid hazardous materials in quantities not exceeding the maximum allowable quantity per *control area* in Group M or S occupancies complying with Section 414.2.5.
14. The storage of black powder, smokeless propellant and small arms primers in Groups M and R-3 and special industrial explosive devices in Groups B, F, M and S, provided such storage conforms to the quantity limits and requirements prescribed in the *Fire Code*.

307.1.2 Hazardous materials. Hazardous materials in any quantity shall conform to the requirements of this code, including Section 414, and the *Fire Code*.

307.2 Definitions. The following terms are defined in Chapter 2:

AEROSOL

Level 1 aerosol products.

Level 2 aerosol products.

Level 3 aerosol products.

AEROSOL CONTAINER.

BALED COTTON.

BALED COTTON, DENSELY PACKED.

BARRICADE.

Artificial barricade.

Natural barricade.

BOILING POINT.

CLOSED SYSTEM.

COMBUSTIBLE DUST.

COMBUSTIBLE FIBERS.

COMBUSTIBLE LIQUID.

Class II.

Class IIIA.

Class IIIB.

COMPRESSED GAS.

CONTROL AREA.

CORROSIVE.

CRYOGENIC FLUID.

DAY BOX.

DEFLAGRATION.

DETONATION.

DISPENSING.

EXPLOSION.

EXPLOSIVE.

High explosive.

Low explosive.

Mass-detonating explosives.

UN/DOtn Class 1 explosives.

Division 1.1.

Division 1.2.

Division 1.3.

Division 1.4.

Division 1.5.

Division 1.6.

FIREWORKS.

Fireworks, 1.3G.

Fireworks, 1.4G.

FLAMMABLE GAS.

FLAMMABLE LIQUEFIED GAS.

FLAMMABLE LIQUID.

Class IA.

Class IB.

Class IC.

FLAMMABLE MATERIAL.

FLAMMABLE SOLID.

FLASH POINT.

HANDLING.

HAZARDOUS MATERIALS.

HEALTH HAZARD.

HIGHLY TOXIC.

INCOMPATIBLE MATERIALS.

INERT GAS.

OPEN SYSTEM.

OPERATING BUILDING.

ORGANIC PEROXIDE.

Class I.

Class II.

Class III.

Class IV.

Class V.

Unclassified detonable.

OXIDIZER.

Class 4.

Class 3.

Class 2.

Class 1.

OXIDIZING GAS.**PHYSICAL HAZARD.****PYROPHORIC.****PYROTECHNIC COMPOSITION.****TOXIC.****UNSTABLE (REACTIVE) MATERIAL.**

Class 4.

Class 3.

Class 2.

Class 1.

WATER-REACTIVE MATERIAL.

Class 3.

Class 2.

Class 1.

307.3 High-hazard Group H-1. Buildings and structures containing materials that pose a detonation hazard shall be classified as Group H-1. Such materials shall include, but not be limited to, the following:

Detonable pyrophoric materials

Explosives:

Division 1.1

Division 1.2

Division 1.3

Division 1.4

Division 1.5

Division 1.6

TABLE 307.1(1)
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD^{a, j, m, n, p}

| MATERIAL | CLASS | GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED | STORAGE ^b | | | USE-CLOSED SYSTEMS ^b | | | USE-OPEN SYSTEMS ^b | |
|--|--------------------------|---|---------------------------|--|--------------------------|---------------------------------|---|--------------------------|-------------------------------|--|
| | | | Solid pounds (cubic feet) | Liquid gallons (pounds) | Gas cubic feet at NTP | Solid pounds (cubic feet) | Liquid gallons (pounds) | Gas cubic feet at NTP | Solid pounds (cubic feet) | Liquid gallons (pounds) |
| Combustible dust | NA | H-2 | See Note q | NA | NA | See Note q | NA | NA | See Note q | NA |
| Combustible fiber ^q | Loose Baled ^o | H-3 | (100) (1,000) | NA | NA | (100) (1,000) | NA | NA | (20) (200) | NA |
| Combustible liquid ^{c, i} | II IIIA IIIB | H-2 or H-3 H-2 or H-3 NA | NA | 120 ^{d, e} 330 ^{d, e} 13,200 ^{e, f} | NA | NA | 120 ^d 330 ^d 13,200 ^f | NA | NA | 30 ^d 80 ^d 3,300 ^f |
| Consumer fireworks | 1.4G | H-3 | 125 ^{e, i} | NA | NA | NA | NA | NA | NA | NA |
| Cryogenic flammable | NA | H-2 | NA | 45 ^d | NA | NA | 45 ^d | NA | NA | 10 ^d |
| Cryogenic inert | NA | NA | NA | NA | NL | NA | NA | NL | NA | NA |
| Cryogenic oxidizing | NA | H-3 | NA | 45 ^d | NA | NA | 45 ^d | NA | NA | 10 ^d |
| Explosives | Division 1.1 | H-1 | 1 ^{e, g} | (1) ^{e, g} | NA | 0.25 ^g | (0.25) ^g | NA | 0.25 ^g | (0.25) ^g |
| | Division 1.2 | H-1 | 1 ^{e, g} | (1) ^{e, g} | | 0.25 ^g | (0.25) ^g | | 0.25 ^g | (0.25) ^g |
| | Division 1.3 | H-1 or H-2 | 5 ^{e, g} | (5) ^{e, g} | | 1 ^g | (1) ^g | | 1 ^g | (1) ^g |
| | Division 1.4 | H-3 | 50 ^{e, g} | (50) ^{e, g} | | 50 ^g | (50) ^g | | NA | NA |
| | Division 1.4G | H-3 | 125 ^{d, e, i} | NA | | NA | NA | | NA | NA |
| | Division 1.5 | H-1 | 1 ^{e, g} | (1) ^{e, g} | | 0.25 ^g | (0.25) ^g | | 0.25 ^g | (0.25) ^g |
| | Division 1.6 | H-1 | 1 ^{e, g} | NA | | NA | NA | | NA | NA |
| Flammable gas | Gaseous Liquefied | H-2 | NA | NA (150) ^{d, e} | 1,000 ^{d, e} NA | NA | NA (150) ^{d, e} | 1,000 ^{d, e} NA | NA | NA |
| Flammable liquid ^c | IA IB and IC | H-2 or H-3 | NA | 30 ^{d, e} 120 ^{d, e} | NA | NA | 30 ^d 120 ^d | NA | NA | 10 ^d 30 ^d |
| Flammable liquid, combination (IA, IB, IC) | NA | H-2 or H-3 | NA | 120 ^{d, e, h} | NA | NA | 120 ^{d, h} | NA | NA | 30 ^{d, h} |

(continued)

USE AND OCCUPANCY CLASSIFICATION

TABLE 307.1(1)—continued
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD^{a, j, m, n, p}

| MATERIAL | CLASS | GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED | STORAGE ^b | | | USE-CLOSED SYSTEMS ^b | | | USE-OPEN SYSTEMS ^b | |
|---------------------|----------------|---|---------------------------|-------------------------|-----------------------|---------------------------------|-------------------------|-----------------------|-------------------------------|-------------------------|
| | | | Solid pounds (cubic feet) | Liquid gallons (pounds) | Gas cubic feet at NTP | Solid pounds (cubic feet) | Liquid gallons (pounds) | Gas cubic feet at NTP | Solid pounds (cubic feet) | Liquid gallons (pounds) |
| Flammable solid | NA | H-3 | 125 ^{d, e} | NA | NA | 125 ^d | NA | NA | 25 ^d | NA |
| Inert gas | Gaseous | NA | NA | NA | NL | NA | NA | NL | NA | NA |
| | Liquefied | NA | NA | NA | NL | NA | NA | NL | NA | NA |
| Organic peroxide | UD | H-1 | 1 ^{e, g} | (1) ^{e, g} | NA | 0.25 ^g | (0.25) ^g | NA | 0.25 ^g | (0.25) ^g |
| | I | H-2 | 5 ^{d, e} | (5) ^{d, e} | | 1 ^d | (1) ^d | | 1 ^d | (1) ^d |
| | II | H-3 | 50 ^{d, e} | (50) ^{d, e} | | 50 ^d | (50) ^d | | 10 ^d | (10) ^d |
| | III | H-3 | 125 ^{d, e} | (125) ^{d, e} | | 125 ^d | (125) ^d | | 25 ^d | (25) ^d |
| | IV | NA | NL | NL | | NL | NL | | NL | NL |
| | V | NA | NL | NL | | NL | NL | | NL | NL |
| Oxidizer | 4 | H-1 | 1 ^g | (1) ^{e, g} | NA | 0.25 ^g | (0.25) ^g | NA | 0.25 ^g | (0.25) ^g |
| | 3 ^k | H-2 or H-3 | 10 ^{d, e} | (10) ^{d, e} | | 2 ^d | (2) ^d | | 2 ^d | (2) ^d |
| | 2 | H-3 | 250 ^{d, e} | (250) ^{d, e} | | 250 ^d | (250) ^d | | 50 ^d | (50) ^d |
| | 1 | NA | 4,000 ^{e, f} | (4,000) ^{e, f} | | 4,000 ^f | (4,000) ^f | | 1,000 ^f | (1,000) ^f |
| Oxidizing gas | Gaseous | H-3 | NA | NA | 1,500 ^{d, e} | NA | NA | 1,500 ^{d, e} | NA | NA |
| | Liquefied | | | (150) ^{d, e} | NA | | (150) ^{d, e} | NA | | |
| Pyrophoric | NA | H-2 | 4 ^{e, g} | (4) ^{e, g} | 50 ^{e, g} | 1 ^g | (1) ^g | 10 ^{e, g} | 0 | 0 |
| Unstable (reactive) | 4 | H-1 | 1 ^{e, g} | (1) ^{e, g} | 10 ^{e, g} | 0.25 ^g | (0.25) ^g | 2 ^{e, g} | 0.25 ^g | (0.25) ^g |
| | 3 | H-1 or H-2 | 5 ^{d, e} | (5) ^{d, e} | 50 ^{d, e} | 1 ^d | (1) ^d | 10 ^{d, e} | 1 ^d | (1) ^d |
| | 2 | H-3 | 50 ^{d, e} | (50) ^{d, e} | 750 ^{d, e} | 50 ^d | (50) ^d | 750 ^{d, e} | 10 ^d | (10) ^d |
| | 1 | NA | NL | NL | NL | NL | NL | NL | NL | NL |
| Water reactive | 3 | H-2 | 5 ^{d, e} | (5) ^{d, e} | NA | 5 ^d | (5) ^d | NA | 1 ^d | (1) ^d |
| | 2 | H-3 | 50 ^{d, e} | (50) ^{d, e} | | 50 ^d | (50) ^d | | 10 ^d | (10) ^d |
| | 1 | NA | NL | NL | | NL | NL | | NL | NL |

For SI: 1 cubic foot = 0.028 m³, 1 pound = 0.454 kg, 1 gallon = 3.785 L.

NL = Not Limited; NA = Not Applicable; UD = Unclassified Detonable.

a. For use of control areas, see Section 414.2.

b. The aggregate quantity in use and storage shall not exceed the quantity listed for storage.

c. The quantities of alcoholic beverages in retail and wholesale sales occupancies shall not be limited provided the liquids are packaged in individual containers not exceeding 1.3 gallons. In retail and wholesale sales occupancies, the quantities of medicines, foodstuffs or consumer products, and cosmetics containing not more than 50 percent by volume of water-miscible liquids with the remainder of the solutions not being flammable, shall not be limited, provided that such materials are packaged in individual containers not exceeding 1.3 gallons.

d. Maximum allowable quantities shall be increased 100 percent in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1. Where Note e also applies, the increase for both notes shall be applied cumulatively.

e. Maximum allowable quantities shall be increased 100 percent when stored in approved storage cabinets, day boxes, gas cabinets, gas rooms or exhausted enclosures or in *listed* safety cans in accordance with Section 5003.9.10 of the *Fire Code*. Where Note d also applies, the increase for both notes shall be applied cumulatively.

f. Quantities shall not be limited in a building equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

g. Allowed only in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

h. Containing not more than the maximum allowable quantity per *control area* of Class IA, IB or IC flammable liquids.

i. The maximum allowable quantity shall not apply to fuel oil storage complying with Section 603.3.2 of the *Fire Code*.

j. Quantities in parenthesis indicate quantity units in parenthesis at the head of each column.

k. A maximum quantity of 200 pounds of solid or 20 gallons of liquid Class 3 oxidizers is allowed when such materials are necessary for maintenance purposes, operation or sanitation of equipment when the storage containers and the manner of storage are approved.

l. Net weight of the pyrotechnic composition of the fireworks. Where the net weight of the pyrotechnic composition of the fireworks is not known, 25 percent of the gross weight of the fireworks, including packaging, shall be used.

m. For gallons of liquids, divide the amount in pounds by 10 in accordance with Section 5003.1.2 of the *Fire Code*.

n. For storage and display quantities in Group M and storage quantities in Group S occupancies complying with Section 414.2.5, see Tables 414.2.5(1) and 414.2.5(2).

o. Densely packed baled cotton that complies with the packing requirements of ISO 8115 shall not be included in this material class.

p. The following shall not be included in determining the maximum allowable quantities:

1. Liquid or gaseous fuel in fuel tanks on vehicles.

2. Liquid or gaseous fuel in fuel tanks on motorized equipment operated in accordance with the *Fire Code*.

3. Gaseous fuels in piping systems and fixed appliances regulated by the *Fuel Gas Code*.

4. Liquid fuels in piping systems and fixed appliances regulated by the *Mechanical Code*.

5. Alcohol-based hand rubs classified as Class I or II liquids in dispensers that are installed in accordance with Sections 5705.5 and 5705.5.1 of the *Fire Code*. The location of the alcohol-based hand rub (ABHR) dispensers shall be provided in the construction documents.

q. Where manufactured, generated or used in such a manner that the concentration and conditions create a fire or explosion hazard based on information prepared in accordance with Section 414.1.3.

TABLE 307.1(2)
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIAL POSING A HEALTH HAZARD^{a, c, f, h, i}

| MATERIAL | STORAGE ^b | | | USE-CLOSED SYSTEMS ^b | | | USE-OPEN SYSTEMS ^b | |
|--------------|------------------------------|---|--|---------------------------------|--------------------------------------|--|-------------------------------|--------------------------------------|
| | Solid pounds ^{d, e} | Liquid gallons (pounds) ^{d, e} | Gas cubic feet at NTP (pounds) ^d | Solid pounds ^d | Liquid gallons (pounds) ^d | Gas cubic feet at NTP (pounds) ^d | Solid pounds ^d | Liquid gallons (pounds) ^d |
| Corrosives | 5,000 | 500 | Gaseous 810 ^c Liquefied (150) | 5,000 | 500 | Gaseous 810 ^c Liquefied (150) | 1,000 | 100 |
| Highly Toxic | 10 | (10) | Gaseous 20 ^g Liquefied (4) ^g | 10 | (10) | Gaseous 20 ^g Liquefied (4) ^g | 3 | (3) |
| Toxic | 500 | (500) | Gaseous 810 ^c Liquefied (150) ^c | 500 | (500) | Gaseous 810 ^c Liquefied (150) ^c | 125 | (125) |

For SI: 1 cubic foot = 0.028 m³, 1 pound = 0.454 kg, 1 gallon = 3.785 L.

a. For use of control areas, see Section 414.2.

b. The aggregate quantity in use and storage shall not exceed the quantity listed for storage.

c. In retail and wholesale sales occupancies, the quantities of medicines, foodstuffs or consumer products, and cosmetics containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solutions not being flammable, shall not be limited, provided that such materials are packaged in individual containers not exceeding 1.3 gallons.

d. Maximum allowable quantities shall be increased 100 percent in buildings equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1. Where Note e also applies, the increase for both notes shall be applied cumulatively.

e. Maximum allowable quantities shall be increased 100 percent where stored in approved storage cabinets, gas cabinets or exhausted enclosures as specified in the *Fire Code*. Where Note d also applies, the increase for both notes shall be applied cumulatively.

f. For storage and display quantities in Group M and storage quantities in Group S occupancies complying with Section 414.2.5, see Tables 414.2.5(1) and 414.2.5(2).

g. Allowed only where stored in approved exhausted gas cabinets or exhausted enclosures as specified in the *Fire Code*.

h. Quantities in parenthesis indicate quantity units in parenthesis at the head of each column.

i. For gallons of liquids, divide the amount in pounds by 10 in accordance with Section 5003.1.2 of the *Fire Code*.

Organic peroxides, unclassified detonable

Oxidizers, Class 4

Unstable (reactive) materials, Class 3 detonable and Class 4

307.3.1 Occupancies containing explosives not classified as H-1. The following occupancies containing explosive materials shall be classified as follows:

1. Division 1.3 explosive materials that are used and maintained in a form where either confinement or configuration will not elevate the hazard from a mass fire to mass explosion hazard shall be allowed in H-2 occupancies.
2. Articles, including articles packaged for shipment, that are not regulated as a Division 1.4 explosive under Bureau of Alcohol, Tobacco, Firearms and Explosives regulations, or unpackaged articles used in process operations that do not propagate a detonation or deflagration between articles shall be allowed in H-3 occupancies.

307.4 High-hazard Group H-2. Buildings and structures containing materials that pose a deflagration hazard or a hazard from accelerated burning shall be classified as Group H-2. Such materials shall include, but not be limited to, the following:

Class I, II or IIIA flammable or combustible liquids that are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than 15 pounds per square inch gauge (103.4 kPa).

Combustible dusts where manufactured, generated or used in such a manner that the concentration and conditions create a fire or explosion hazard based on information prepared in accordance with Section 414.1.3.

Cryogenic fluids, flammable.

Flammable gases.

Organic peroxides, Class I.

Oxidizers, Class 3, that are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than 15 pounds per square inch gauge (103 kPa).

Pyrophoric liquids, solids and gases, nondetonable.

Unstable (reactive) materials, Class 3, nondetonable.

Water-reactive materials, Class 3.

307.5 High-hazard Group H-3. Buildings and structures containing materials that readily support combustion or that pose a physical hazard shall be classified as Group H-3. Such materials shall include, but not be limited to, the following:

Class I, II or IIIA flammable or combustible liquids that are used or stored in normally closed containers or systems pressurized at 15 pounds per square inch gauge (103.4 kPa) or less.

Combustible fibers, other than densely packed baled cotton, where manufactured, generated or used in such a manner that the concentration and conditions create a fire or explosion hazard based on information prepared in accordance with Section 414.1.3.

Consumer fireworks, 1.4G (Class C, Common)

Cryogenic fluids, oxidizing

Flammable solids

Organic peroxides, Class II and III

Oxidizers, Class 2

Oxidizers, Class 3, that are used or stored in normally closed containers or systems pressurized at 15 pounds per square inch gauge (103 kPa) or less

Oxidizing gases

Unstable (reactive) materials, Class 2

Water-reactive materials, Class 2

307.6 High-hazard Group H-4. Buildings and structures containing materials that are health hazards shall be classified as Group H-4. Such materials shall include, but not be limited to, the following:

- Corrosives
- Highly toxic materials
- Toxic materials

307.7 High-hazard Group H-5. Semiconductor fabrication facilities and comparable research and development areas in which hazardous production materials (HPM) are used and the aggregate quantity of materials is in excess of those listed in Tables 307.1(1) and 307.1(2) shall be classified as Group H-5. Such facilities and areas shall be designed and constructed in accordance with Section 415.11.

307.8 Multiple hazards. Buildings and structures containing a material or materials representing hazards that are classified in one or more of Groups H-1, H-2, H-3 and H-4 shall conform to the code requirements for each of the occupancies so classified.

SECTION 308 INSTITUTIONAL GROUP I

308.1 Institutional Group I. Institutional Group I occupancy includes, among others, the use of a building or structure, or a portion thereof, in which care or supervision is provided to persons who are or are not capable of self-preservation without physical assistance or in which persons are detained for penal or correctional purposes or in which the liberty of the occupants is restricted. Institutional occupancies shall be classified as Group I-1, I-2, I-3 or I-4.

308.2 Definitions. The following terms are defined in Chapter 2:

24-HOUR BASIS.

CUSTODIAL CARE.

DETOXIFICATION FACILITIES.

FOSTER CARE FACILITIES.

HOSPITALS AND PSYCHIATRIC HOSPITALS.

INCAPABLE OF SELF-PRESERVATION.

MEDICAL CARE.

NURSING HOMES.

308.3 Institutional Group I-1. Institutional Group I-1 occupancy shall include buildings, structures or portions thereof for more than 16 persons, excluding staff, who reside on a 24-hour basis in a supervised environment and receive custodial care. Buildings of Group I-1 shall be classified as one of the occupancy conditions specified in Section 308.3.1 or 308.3.2. This group shall include, but not be limited to, the following:

- Alcohol and drug centers
- Assisted living facilities
- Congregate care facilities

Group homes

Halfway houses

Residential board and care facilities

Social rehabilitation facilities

308.3.1 Condition 1. This occupancy condition shall include buildings in which all persons receiving custodial care who, without any assistance, are capable of responding to an emergency situation to complete building evacuation.

308.3.2 Condition 2. This occupancy condition shall include buildings in which there are any persons receiving custodial care who require limited verbal or physical assistance while responding to an emergency situation to complete building evacuation.

308.3.3 Seven to 16 persons receiving custodial care. A facility housing not fewer than seven and not more than 16 persons receiving custodial care shall be classified as Group R-4.

308.3.4 Six or fewer persons receiving custodial care. A facility with six or fewer persons receiving custodial care shall be classified as Group R-3 or shall comply with the *Residential Code*, provided that an *automatic sprinkler system* is installed in accordance with Section 903.3.1.3 or Section P2904 of the *Residential Code*.

308.4 Institutional Group I-2. Institutional Group I-2 occupancy shall include buildings and structures used for *medical care* on a 24-hour basis for more than six persons who are *incapable of self-preservation*. This group shall include, but not be limited to, the following:

1. Foster care facilities.
2. Detoxification facilities.
3. Hospitals.
4. Nursing homes.
5. Psychiatric hospitals.

308.4.1 Occupancy conditions. Buildings of Group I-2 shall be classified as one of the occupancy conditions specified in Section 308.4.1.1 or 308.4.1.2.

308.4.1.1 Condition 1. This occupancy condition shall include facilities that provide nursing and medical care but do not provide emergency care, surgery, obstetrics or in-patient stabilization units for psychiatric or detoxification, including but not limited to nursing homes and foster care facilities.

308.4.1.2 Condition 2. This occupancy condition shall include facilities that provide nursing and medical care and could provide emergency care, surgery, obstetrics or in-patient stabilization units for psychiatric or detoxification, including but not limited to hospitals.

308.4.2 Six or fewer persons receiving medical care. A facility with six or fewer persons receiving medical care shall be classified as Group R-3 or shall comply with the

Residential Code, provided that an *automatic sprinkler system* is installed in accordance with Section 903.3.1.3 or Section P2904 of the *Residential Code*.

308.5 Institutional Group I-3. Institutional Group I-3 occupancy shall include buildings and structures that are inhabited by more than five persons who are under restraint or security. A Group I-3 facility is occupied by persons who are generally *incapable of self-preservation* due to security measures not under the occupants' control. This group shall include, but not be limited to, the following:

- Correctional centers
- Detention centers
- Jails
- Prerelease centers
- Prisons
- Reformatories

Buildings of Group I-3 shall be classified as one of the occupancy conditions specified in Sections 308.5.1 through 308.5.5 (see Section 408.1).

308.5.1 Condition 1. This occupancy condition shall include buildings in which free movement is allowed from sleeping areas, and other spaces where access or occupancy is permitted, to the exterior via *means of egress* without restraint. A Condition 1 facility is permitted to be constructed as Group R.

308.5.2 Condition 2. This occupancy condition shall include buildings in which free movement is allowed from sleeping areas and any other occupied *smoke compartment* to one or more other *smoke compartments*. Egress to the exterior is impeded by locked *exits*.

308.5.3 Condition 3. This occupancy condition shall include buildings in which free movement is allowed within individual *smoke compartments*, such as within a residential unit comprised of individual *sleeping units* and group activity spaces, where egress is impeded by remote-controlled release of *means of egress* from such a *smoke compartment* to another *smoke compartment*.

308.5.4 Condition 4. This occupancy condition shall include buildings in which free movement is restricted from an occupied space. Remote-controlled release is provided to permit movement from *sleeping units*, activity spaces and other occupied areas within the *smoke compartment* to other *smoke compartments*.

308.5.5 Condition 5. This occupancy condition shall include buildings in which free movement is restricted from an occupied space. Staff-controlled manual release is provided to permit movement from *sleeping units*, activity spaces and other occupied areas within the *smoke compartment* to other *smoke compartments*.

308.6 Institutional Group I-4, day care facilities. Institutional Group I-4 occupancy shall include buildings and structures occupied by more than five persons of any age who receive *custodial care* for fewer than 24 hours per day by persons other than parents or guardians, relatives by blood, marriage or adoption, and in a place other than the home of the

person cared for. This group shall include, but not be limited to, the following:

- Adult day care
- Child day care

308.6.1 Classification as Group E. A child day care facility that provides care for more than five but not more than 100 children 2½ years or less of age, where the rooms in which the children are cared for are located on a *level of exit discharge* serving such rooms and each of these child care rooms has an *exit* door directly to the exterior, shall be classified as Group E.

308.6.2 Within a place of religious worship. Rooms and spaces within *places of religious worship* providing such care during religious functions shall be classified as part of the primary occupancy.

308.6.3 Five or fewer persons receiving care. A facility having five or fewer persons receiving custodial care in a facility other than a *dwelling unit* within the scope of Section 308.6.4, shall be classified as part of the primary occupancy.

308.6.4 Persons receiving custodial care in a dwelling unit. A facility providing custodial care in a *dwelling unit* within either (1) a detached one- or two-family dwelling or townhouse within the scope of the *Residential Code*, or (2) a Group R-3 *dwelling*, shall comply with Appendix M of the *Residential Code*.

SECTION 309 MERCANTILE GROUP M

309.1 Mercantile Group M. Mercantile Group M occupancy includes, among others, the use of a building or structure or a portion thereof for the display and sale of merchandise, and involves stocks of goods, wares or merchandise incidental to such purposes and accessible to the public. Mercantile occupancies shall include, but not be limited to, the following:

- Department stores
- Drug stores
- Markets
- Motor fuel-dispensing facilities
- Retail or wholesale stores
- Sales rooms

309.2 Quantity of hazardous materials. The aggregate quantity of nonflammable solid and nonflammable or non-combustible liquid hazardous materials stored or displayed in a single *control area* of a Group M occupancy shall not exceed the quantities in Table 414.2.5(1).

SECTION 310 RESIDENTIAL GROUP R

310.1 Residential Group R. Residential Group R includes, among others, the use of a building or structure, or a portion thereof, for sleeping purposes when not classified as an Institutional Group I or when not regulated by the *Residential Code*.

310.2 Definitions. The following terms are defined in Chapter 2:

BOARDING HOUSE.

CONGREGATE LIVING FACILITIES.

DORMITORY.

GROUP HOME.

GUEST ROOM.

LODGING HOUSE.

PERSONAL CARE SERVICE.

TRANSIENT.

310.3 Residential Group R-1. Residential Group R-1 occupancies containing *sleeping units* where the occupants are primarily *transient* in nature, including:

- Boarding houses (transient)* with more than 10 occupants
- Congregate living facilities (transient)* with more than 10 occupants
- Hotels (transient)*
- Motels (transient)*

310.4 Residential Group R-2. Residential Group R-2 occupancies containing *sleeping units* or more than two *dwelling units* where the occupants are primarily permanent in nature, including:

- Apartment houses
- Boarding houses* (nontransient) with more than 16 occupants
- Congregate living facilities* (nontransient) with more than 16 occupants
- Convents
- Dormitories*
- Fraternities and sororities
- Hotels (nontransient)
- Live/work units*
- Monasteries
- Motels (nontransient)
- Vacation timeshare properties

310.5 Residential Group R-3. Residential Group R-3 occupancies where the occupants are primarily permanent in nature and not classified as Group R-1, R-2, R-4 or I, including:

1. Buildings that do not contain more than two *dwelling units*.
2. *Boarding houses* (nontransient) with 16 or fewer occupants.
3. *Boarding houses (transient)* with 10 or fewer occupants.
4. Care facilities that provide accommodations for six or fewer persons receiving care.
5. *Congregate living facilities* (nontransient) with 16 or fewer occupants.
6. *Congregate living facilities (transient)* with 10 or fewer occupants.
7. *Lodging houses* with five or fewer *guest rooms*.

310.5.1 Care facilities within a dwelling. Care facilities for six or fewer persons receiving care that are within detached one- and two-family *dwelling*s and *townhouse*s are permitted to comply with the *Residential Code*, provided that an *automatic sprinkler system* is installed in accordance with Section 903.3.1.3 or Section P2904 of the *Residential Code*.

310.5.2 Lodging houses. Owner-occupied *lodging houses* with five or fewer *guest rooms* shall be permitted to be constructed in accordance with the *Residential Code*.

310.6 Residential Group R-4. Residential Group R-4 occupancy shall include buildings, structures or portions thereof for more than six but not more than 16 persons, excluding staff, who reside on a 24-hour basis in a supervised residential environment and receive *custodial care*. Buildings of Group R-4 shall be classified as one of the occupancy conditions specified in Section 310.6.1 or 310.6.2. This group shall include, but not be limited to, the following:

1. Alcohol and drug centers.
2. Assisted living facilities.
3. Congregate care facilities.
4. Convalescent facilities.
5. *Group homes*.
6. Halfway houses.
7. Residential board and *custodial care* facilities.
8. Social rehabilitation facilities.

Group R-4 occupancies shall meet the requirements for construction as defined for Group R-3, except as otherwise provided for in this code.

310.6.1 Condition 1. This occupancy condition shall include buildings in which all persons receiving custodial care, without any assistance, are capable of responding to an emergency situation to complete building evacuation.

310.6.2 Condition 2. This occupancy condition shall include buildings in which there are any persons receiving custodial care who require limited verbal or physical assistance while responding to an emergency situation to complete building evacuation.

SECTION 311 STORAGE GROUP S

311.1 Storage Group S. Storage Group S occupancy includes, among others, the use of a building or structure, or a portion thereof, for storage that is not classified as a hazardous occupancy.

311.1.1 Accessory storage spaces. A room or space used for storage purposes that is less than 100 square feet (9.3 m²) in area and accessory to another occupancy shall be classified as part of that occupancy. The aggregate area of such rooms or spaces shall not exceed the allowable area limits of Section 508.2.

311.2 Moderate-hazard storage, Group S-1. Storage Group S-1 occupancies are buildings occupied for storage uses that are not classified as Group S-2, including, but not limited to, storage of the following:

- Aerosols, Levels 2 and 3
- Aircraft hangar (storage and repair)
- Bags: cloth, burlap and paper
- Bamboos and rattan
- Baskets
- Belting: canvas and leather
- Books and paper in rolls or packs
- Boots and shoes
- Buttons, including cloth covered, pearl or bone
- Cardboard and cardboard boxes
- Clothing, woolen wearing apparel
- Cordage
- Dry boat storage (indoor)
- Furniture
- Furs
- Glues, mucilage, pastes and size
- Grains
- Horns and combs, other than celluloid
- Leather
- Linoleum
- Lumber
- Motor vehicle repair garages complying with the maximum allowable quantities of hazardous materials listed in Table 307.1(1) (see Section 406.8)
- Photo engravings
- Resilient flooring
- Silks
- Soaps
- Sugar
- Tires, bulk storage of
- Tobacco, cigars, cigarettes and snuff
- Upholstery and mattresses
- Wax candles

311.3 Low-hazard storage, Group S-2. Storage Group S-2 occupancies include, among others, buildings used for the storage of noncombustible materials such as products on wood pallets or in paper cartons with or without single thickness divisions; or in paper wrappings. Such products are permitted to have a negligible amount of plastic *trim*, such as knobs, handles or film wrapping. Group S-2 storage uses shall include, but not be limited to, storage of the following:

- Asbestos
- Beverages up to and including 16-percent alcohol in metal, glass or ceramic containers
- Cement in bags
- Chalk and crayons
- Dairy products in nonwaxed coated paper containers
- Dry cell batteries

- Electrical coils
- Electrical motors
- Empty cans
- Food products
- Foods in noncombustible containers
- Fresh fruits and vegetables in nonplastic trays or containers
- Frozen foods
- Glass
- Glass bottles, empty or filled with noncombustible liquids
- Gypsum board
- Inert pigments
- Ivory
- Meats
- Metal cabinets
- Metal desks with plastic tops and *trim*
- Metal parts
- Metals
- Mirrors
- Oil-filled and other types of distribution transformers
- Parking garages, open or enclosed
- Porcelain and pottery
- Stoves
- Talc and soapstones
- Washers and dryers

SECTION 312 UTILITY AND MISCELLANEOUS GROUP U

312.1 General. Buildings and structures of an accessory character and miscellaneous structures not classified in any specific occupancy shall be constructed, equipped and maintained to conform to the requirements of this code commensurate with the fire and life hazard incidental to their occupancy. Group U shall include, but not be limited to, the following:

- Agricultural buildings
- Aircraft hangars, accessory to a one- or two-family residence (see Section 412.5)
- Barns
- Carports
- Fences more than 6 feet (1829 mm) in height
- Grain silos, accessory to a residential occupancy
- Greenhouses
- Livestock shelters
- Private garages
- Retaining walls
- Sheds
- Stables
- Tanks
- Towers

CHAPTER 4

SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY

SECTION 401 SCOPE

401.1 Detailed use and occupancy requirements. In addition to the occupancy and construction requirements in this code, the provisions of this chapter apply to the special uses and occupancies described herein.

SECTION 402 COVERED MALL AND OPEN MALL BUILDINGS

402.1 Applicability. The provisions of this section shall apply to buildings or structures defined herein as *covered or open mall buildings* not exceeding three floor levels at any point nor more than three *stories above grade plane*. Except as specifically required by this section, *covered and open mall buildings* shall meet applicable provisions of this code.

Exceptions:

1. Foyers and lobbies of Groups B, R-1 and R-2 are not required to comply with this section.
2. Buildings need not comply with the provisions of this section where they totally comply with other applicable provisions of this code.

402.1.1 Open space. A *covered mall building* and attached *anchor buildings* and parking garages shall be surrounded on all sides by a permanent open space or not less than 60 feet (18 288 mm). An *open mall building* and *anchor buildings* and parking garages adjoining the perimeter line shall be surrounded on all sides by a permanent open space of not less than 60 feet (18 288 mm).

Exception: The permanent open space of 60 feet (18 288 mm) shall be permitted to be reduced to not less than 40 feet (12 192 mm), provided the following requirements are met:

1. The reduced open space shall not be allowed for more than 75 percent of the perimeter of the *covered or open mall building* and *anchor buildings*;
2. The *exterior wall* facing the reduced open space shall have a *fire-resistance rating* of not less than 3 hours;
3. Openings in the *exterior wall* facing the reduced open space shall have opening protectives with a *fire protection rating* of not less than 3 hours; and
4. Group E, H, I or R occupancies are not located within the *covered or open mall building* or *anchor buildings*.

402.1.2 Open mall building perimeter line. For the purpose of this code, a perimeter line shall be established. The perimeter line shall encircle all buildings and structures that comprise the *open mall building* and shall encompass

any open-air interior walkways, open-air courtyards or similar open-air spaces. The perimeter line shall define the extent of the *open mall building*. *Anchor buildings* and parking structures shall be outside of the perimeter line and are not considered as part of the *open mall building*.

402.2 Definitions. The following terms are defined in Chapter 2:

ANCHOR BUILDING.

COVERED MALL BUILDING.

Mall.

Open mall.

Open mall building.

FOOD COURT.

GROSS LEASABLE AREA.

402.3 Lease plan. Each *owner* of a *covered mall building* or of an *open mall building* shall provide both the building and fire departments with a lease plan showing the location of each occupancy and its *exits* after the certificate of occupancy has been issued. No modifications or changes in occupancy or use shall be made from that shown on the lease plan without prior approval of the *building official*.

402.4 Construction. The construction of *covered and open mall buildings*, *anchor buildings* and parking garages associated with a *mall building* shall comply with Sections 402.4.1 through 402.4.3.

402.4.1 Area and types of construction. The *building area* and type of construction of *covered mall* or *open mall buildings*, *anchor buildings* and parking garages shall comply with this section.

402.4.1.1 Covered and open mall buildings. The *building area* of any *covered mall* or *open mall building* shall not be limited provided the *covered mall* or *open mall building* does not exceed three floor levels at any point nor three *stories above grade plane*, and is of Type I, II, III or IV construction.

402.4.1.2 Anchor buildings. The *building area* and *building height* of any *anchor building* shall be based on the type of construction as required by Section 503 as modified by Sections 504 and 506.

Exception: The *building area* of any *anchor building* shall not be limited provided the *anchor building* is not more than three *stories above grade plane*, and is of Type I, II, III or IV construction.

402.4.1.3 Parking garage. The *building area* and *building height* of any parking garage, open or enclosed, shall be based on the type of construction as required by Sections 406.5 and 406.6, respectively.

402.4.2 Fire-resistance-rated separation. Fire-resistance-rated separation is not required between tenant spaces and the *mall*. Fire-resistance-rated separation is not required between a *food court* and adjacent tenant spaces or the *mall*.

402.4.2.1 Tenant separations. Each tenant space shall be separated from other tenant spaces by a *fire partition* complying with Section 708. A tenant separation wall is not required between any tenant space and the *mall*.

402.4.2.2 Anchor building separation. An *anchor building* shall be separated from the *covered or open mall building* by *fire walls* complying with Section 706.

Exceptions:

1. *Anchor buildings* of not more than three *stories above grade plane* that have an occupancy classification the same as that permitted for tenants of the *mall building* shall be separated by 2-hour fire-resistance-rated *fire barriers* complying with Section 707.
2. The exterior walls of *anchor buildings* separated from an *open mall building* by an *open mall* shall comply with Table 602.

402.4.2.2.1 Openings between anchor building and mall. Except for the separation between Group R-1 *sleeping units* and the *mall*, openings between *anchor buildings* of Type IA, IB, IIA or IIB construction and the *mall* need not be protected.

402.4.2.3 Parking garages. An attached garage for the storage of passenger vehicles having a capacity of not more than nine persons and *open parking garages* shall be considered as a separate building where it is separated from the *covered or open mall building* or *anchor building* by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

Parking garages, open or enclosed, which are separated from *covered mall buildings*, *open mall buildings* or *anchor buildings*, shall comply with the provisions of Table 602.

Pedestrian walkways and tunnels that connect garages to *mall buildings* or *anchor buildings* shall be constructed in accordance with Section 3104.

402.4.3 Open mall construction. Floor assemblies in, and *roof assemblies* over, the *open mall* of an *open mall building* shall be open to the atmosphere for not less than 20 feet (9096 mm), measured perpendicular from the face of the tenant spaces on the lowest level, from edge of balcony to edge of balcony on upper floors and from edge of roof line to edge of roof line. The openings within, or the unroofed area of, an *open mall* shall extend from the lowest/grade level of the open mall through the entire *roof assembly*. Balconies on upper levels of the *mall* shall not project into the required width of the opening.

402.4.3.1 Pedestrian walkways. *Pedestrian walkways* connecting balconies in an *open mall* shall be located not less than 20 feet (9096 mm) from any other *pedestrian walkway*.

402.5 Automatic sprinkler system. *Covered and open mall buildings* and buildings connected shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, which shall comply with all of the following:

1. The *automatic sprinkler system* shall be complete and operative throughout occupied space in the *mall building* prior to occupancy of any of the tenant spaces. Unoccupied tenant spaces shall be similarly protected unless provided with *approved* alternative protection.
2. Sprinkler protection for the *mall* of a *covered mall building* shall be independent from that provided for tenant spaces or *anchor buildings*.
3. Sprinkler protection for the tenant spaces of an *open mall building* shall be independent from that provided for *anchor buildings*.
4. Sprinkler protection shall be provided beneath exterior circulation balconies located adjacent to an *open mall*.
5. Where tenant spaces are supplied by the same system, they shall be independently controlled.

Exception: An *automatic sprinkler system* shall not be required in spaces or areas of *open parking garages* separated from the *covered or open mall building* in accordance with Section 402.4.2.3 and constructed in accordance with Section 406.5.

402.6 Interior finishes and features. Interior finishes within the *mall* and installations within the *mall* shall comply with Sections 402.6.1 through 402.6.4.

402.6.1 Interior finish. *Interior wall and ceiling finishes* within the *mall* of a *covered mall building* and within the *exits* of *covered or open mall buildings* shall have a minimum *flame spread index* and smoke-developed index of Class B in accordance with Chapter 8. *Interior floor finishes* shall meet the requirements of Section 804.

402.6.2 Kiosks. Kiosks and similar structures (temporary or permanent) located within the *mall* of a *covered mall building* or within the perimeter line of an *open mall building* shall meet the following requirements:

1. Combustible kiosks or other structures shall not be located within a *covered or open mall* unless constructed of any of the following materials:
 - 1.1. *Fire-retardant-treated* wood complying with Section 2303.2.
 - 1.2. Foam plastics having a maximum heat release rate not greater than 100 kW (105 Btu/h) when tested in accordance with the exhibit booth protocol in UL 1975 or when tested in accordance with NFPA 289 using the 20 kW ignition source.
 - 1.3. Aluminum composite material (ACM) meeting the requirements of Class A *interior*.

rior finish in accordance with Chapter 8 when tested as an assembly in the maximum thickness intended.

2. Kiosks or similar structures located within the *mall* shall be provided with *approved automatic sprinkler system* and detection devices.
3. The horizontal separation between kiosks or groupings thereof and other structures within the *mall* shall be not less than 20 feet (6096 mm).
4. Each kiosk or similar structure or groupings thereof shall have an area not greater than 300 square feet (28 m²).

402.6.3 Children's play structures. Children's play structures located within the *mall* of a *covered mall building* or within the perimeter line of an *open mall building* shall comply with Section 424. The horizontal separation between children's play structures, kiosks and similar structures within the *mall* shall be not less than 20 feet (6096 mm).

402.6.4 Plastic signs. Plastic signs affixed to the storefront of any tenant space facing a *mall* or *open mall* shall be limited as specified in Sections 402.6.4.1 through 402.6.4.5.

402.6.4.1 Area. Plastic signs shall be not more than 20 percent of the wall area facing the *mall*.

402.6.4.2 Height and width. Plastic signs shall be not greater than 36 inches (914 mm) in height, except that where the sign is vertical, the height shall be not greater than 96 inches (2438 mm) and the width shall be not greater than 36 inches (914 mm).

402.6.4.3 Location. Plastic signs shall be located not less than 18 inches (457 mm) from adjacent tenants.

402.6.4.4 Plastics other than foam plastics. Plastics other than foam plastics used in signs shall be light-transmitting plastics complying with Section 2606.4 or shall have a self-ignition temperature of 650°F (343°C) or greater when tested in accordance with ASTM D1929, and a *flame spread index* not greater than 75 and smoke-developed index not greater than 450 when tested in the manner intended for use in accordance with ASTM E84 or UL 723 or meet the acceptance criteria of Section 803.1.2.1 when tested in accordance with NFPA 286.

402.6.4.4.1 Encasement. Edges and backs of plastic signs in the *mall* shall be fully encased in metal.

402.6.4.5 Foam plastics. Foam plastics used in signs shall have flame-retardant characteristics such that the sign has a maximum heat-release rate of 150 kilowatts when tested in accordance with UL 1975 or when tested in accordance with NFPA 289 using the 20 kW ignition source, and the foam plastics shall have the physical characteristics specified in this section. Foam plastics used in signs installed in accordance with Section 402.6.4 shall not be required to comply with the *flame spread* and smoke-developed indices specified in Section 2603.3.

402.6.4.5.1 Density. The density of foam plastics used in signs shall be not less than 20 pounds per cubic foot (pcf) (320 kg/ m³).

402.6.4.5.2 Thickness. The thickness of foam plastic signs shall not be greater than 1/2 inch (12.7 mm).

402.7 Emergency systems. *Covered and open mall buildings, anchor buildings* and associated parking garages shall be provided with emergency systems complying with Sections 402.7.1 through 402.7.5.

402.7.1 Standpipe system. *Covered and open mall buildings* shall be equipped throughout with a standpipe system as required by Section 905.3.3.

402.7.2 Smoke control. Where a *covered mall building* contains an *atrium*, a smoke control system shall be provided in accordance with Section 404.5.

Exception: A smoke control system is not required in *covered mall buildings* where an *atrium* connects only two stories.

402.7.3 Emergency power. *Covered mall buildings* greater than 50,000 square feet (4645 m²) in area and *open mall buildings* greater than 50,000 square feet (4645 m²) within the established perimeter line shall be provided with emergency power that is capable of operating the *emergency voice/alarm communication system* in accordance with Section 2702.

402.7.4 Emergency voice/alarm communication system. Where the total floor area is greater than 50,000 square feet (4645 m²) within either a *covered mall building* or within the perimeter line of an *open mall building*, an *emergency voice/alarm communication system* shall be provided.

Emergency voice/alarm communication systems serving a *mall*, required or otherwise, shall be accessible to the fire department. The systems shall be provided in accordance with Section 907.5.2.2.

402.7.5 Fire department access to equipment. Rooms or areas containing controls for air-conditioning systems, *automatic fire-extinguishing systems, automatic sprinkler systems* or other detection, suppression or control elements shall be identified for use by the fire department.

402.8 Means of egress. *Covered mall buildings, open mall buildings* and each tenant space within a *mall building* shall be provided with *means of egress* as required by this section and this code. Where there is a conflict between the requirements of this code and the requirements of Sections 402.8.1 through 402.8.8, the requirements of Sections 402.8.1 through 402.8.8 shall apply.

402.8.1 Mall width. For the purpose of providing required egress, *malls* are permitted to be considered as *corridors* but need not comply with the requirements of Section 1005.1 of this code where the width of the *mall* is as specified in this section.

402.8.1.1 Minimum width. The aggregate clear egress width of the *mall* in either a *covered or open mall building* shall be not less than 20 feet (6096 mm). The *mall* width shall be sufficient to accommodate the

occupant load served. No portion of the minimum required aggregate egress width shall be less than 10 feet (3048 mm) measured to a height of 8 feet (2438 mm) between any projection of a tenant space bordering the *mall* and the nearest kiosk, vending machine, bench, display opening, *food court* or other obstruction to *means of egress* travel.

402.8.2 Determination of occupant load. The *occupant load* permitted in any individual tenant space in a *covered or open mall building* shall be determined as required by this code. *Means of egress* requirements for individual tenant spaces shall be based on the *occupant load* thus determined.

402.8.2.1 Occupant formula. In determining required *means of egress* of the *mall*, the number of occupants for whom *means of egress* are to be provided shall be based on *gross leasable area* of the *covered or open mall building* (excluding *anchor buildings*) and the *occupant load* factor as determined by Equation 4-1.

$$OLF = (0.00007) (GLA) + 25 \quad \text{(Equation 4-1)}$$

where:

OLF = The *occupant load* factor (square feet per person).

GLA = The *gross leasable area* (square feet).

Exception: Tenant spaces attached to a *covered or open mall building* but with a *means of egress* system that is totally independent of the *open mall* of an *open mall building* or of a *covered mall building* shall not be considered as *gross leasable area* for determining the required *means of egress* for the *mall building*.

402.8.2.2 OLF range. The *occupant load* factor (*OLF*) is not required to be less than 30 and shall not exceed 50.

402.8.2.3 Anchor buildings. The *occupant load* of *anchor buildings* opening into the *mall* shall not be included in computing the total number of occupants for the *mall*.

402.8.2.4 Food courts. The *occupant load* of a *food court* shall be determined in accordance with Section 1004. For the purposes of determining the *means of egress* requirements for the *mall*, the *food court occupant load* shall be added to the *occupant load* of the *covered or open mall building* as calculated above.

402.8.3 Number of means of egress. Wherever the distance of travel to the *mall* from any location within a tenant space used by persons other than employees is greater than 75 feet (22 860 mm) or the tenant space has an *occupant load* of 50 or more, no fewer than two *means of egress* shall be provided.

402.8.4 Arrangements of means of egress. Assembly occupancies with an *occupant load* of 500 or more located within a *covered mall building* shall be so located such that their entrance will be immediately adjacent to a prin-

cipal entrance to the *mall* and shall have not less than one-half of their required *means of egress* opening directly to the exterior of the *covered mall building*. Assembly occupancies located within the perimeter line of an *open mall building* shall be permitted to have their main *exit* open to the *open mall*.

402.8.4.1 Anchor building means of egress. Required *means of egress* for *anchor buildings* shall be provided independently from the *mall means of egress* system. The *occupant load* of *anchor buildings* opening into the *mall* shall not be included in determining *means of egress* requirements for the *mall*. The path of egress travel of *malls* shall not exit through *anchor buildings*. *Malls* terminating at an *anchor building* where no other *means of egress* has been provided shall be considered as a dead-end *mall*.

402.8.5 Distance to exits. Within each individual tenant space in a *covered or open mall building*, the distance of travel from any point to an *exit* or entrance to the *mall* shall be not greater than 200 feet (60 960 mm).

The distance of travel from any point within a *mall* of a *covered mall building* to an *exit* shall be not greater than 200 feet (60 960 mm). The maximum distance of travel from any point within an *open mall* to the perimeter line of the *open mall building* shall be not greater than 200 feet (60 960 mm).

402.8.6 Access to exits. Where more than one *exit* is required, they shall be so arranged that it is possible to travel in either direction from any point in a *mall* of a *covered mall building* to separate *exits* or from any point in an *open mall* of an *open mall building* to two separate locations on the perimeter line, provided neither location is an exterior wall of an *anchor building* or parking garage. The width of an *exit passageway* or *corridor* from a *mall* shall be not less than 66 inches (1676 mm).

Exception: Access to exits is permitted by way of a dead-end *mall* that does not exceed a length equal to twice the width of the *mall* measured at the narrowest location within the dead-end portion of the *mall*.

402.8.6.1 Exit passageways. Where *exit passageways* provide a secondary *means of egress* from a tenant space, doorways to the *exit passageway* shall be protected by 1-hour *fire door assemblies* that are self- or automatic-closing by smoke detection in accordance with Section 716.5.9.3.

402.8.7 Service areas fronting on exit passageways. Mechanical rooms, electrical rooms, building service areas and service elevators are permitted to open directly into *exit passageways*, provided the *exit passageway* is separated from such rooms with not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The *fire protection rating* of openings in the *fire barriers* shall be not less than 1 hour.

402.8.8 Security grilles and doors. Horizontal sliding or vertical security grilles or doors that are a part of a required *means of egress* shall conform to the following:

1. Doors and grilles shall remain in the full open position during the period of occupancy by the general public.
2. Doors or grilles shall not be brought to the closed position when there are 10 or more persons occupying spaces served by a single *exit* or 50 or more persons occupying spaces served by more than one *exit*.
3. The doors or grilles shall be openable from within without the use of any special knowledge or effort where the space is occupied.
4. Where two or more *exits* are required, not more than one-half of the *exits* shall be permitted to include either a horizontal sliding or vertical rolling grille or door.

SECTION 403 HIGH-RISE BUILDINGS

403.1 Applicability. *High-rise buildings* shall comply with Sections 403.2 through 403.6.

Exception: The provisions of Sections 403.2 through 403.6 shall not apply to the following buildings and structures:

1. Airport traffic control towers in accordance with Section 412.3.
2. *Open parking garages* in accordance with Section 406.5.
3. The portion of a building containing a Group A-5 occupancy in accordance with Section 303.6.
4. Special industrial occupancies in accordance with Section 503.1.1.
5. Buildings with:
 - 5.1. A Group H-1 occupancy;
 - 5.2. A Group H-2 occupancy in accordance with Section 415.8, 415.9.2, 415.9.3 or 426.1; or,
 - 5.3. A Group H-3 occupancy in accordance with Section 415.8.

403.2 Construction. The construction of *high-rise buildings* shall comply with the provisions of Sections 403.2.1 through 403.2.4.

403.2.1 Reduction in fire-resistance rating. The *fire-resistance-rating* reductions listed in Sections 403.2.1.1 and 403.2.1.2 shall be allowed in buildings that have sprinkler control valves equipped with supervisory initiating devices and water-flow initiating devices for each floor.

403.2.1.1 Type of construction. The following reductions in the minimum *fire-resistance rating* of the

building elements in Table 601 shall be permitted as follows:

1. For buildings not greater than 420 feet (128 000 mm) in *building height*, the *fire-resistance rating* of the building elements in Type IA construction shall be permitted to be reduced to the minimum *fire-resistance ratings* for the building elements in Type IB.

Exception: The required *fire-resistance rating* of columns supporting floors shall not be reduced.

2. In other than Group F-1, M and S-1 occupancies, the *fire-resistance rating* of the building elements in Type IB construction shall be permitted to be reduced to the *fire-resistance ratings* in Type IIA.
3. The *building height* and *building area* limitations of a building containing building elements with reduced *fire-resistance ratings* shall be permitted to be the same as the building without such reductions.

403.2.1.2 Shaft enclosures. For buildings not greater than 420 feet (128 000 mm) in *building height*, the required *fire-resistance rating* of the *fire barriers* enclosing vertical *shafts*, other than *interior exit stairway* and elevator hoistway enclosures, is permitted to be reduced to 1 hour where automatic sprinklers are installed within the *shafts* at the top and at alternate floor levels.

403.2.2 Seismic considerations. For seismic considerations, see Chapter 16.

403.2.3 Structural integrity of interior exit stairways and elevator hoistway enclosures. For *high-rise buildings* of Risk Category III or IV in accordance with Section 1604.5, and for all buildings that are more than 420 feet (128 000 mm) in *building height*, enclosures for *interior exit stairways* and elevator hoistway enclosures shall comply with Sections 403.2.3.1 through 403.2.3.4.

403.2.3.1 Wall assembly. The wall assemblies making up the enclosures for *interior exit stairways* and elevator hoistway enclosures shall meet or exceed Soft Body Impact Classification Level 2 as measured by the test method described in ASTM C1629/C1629M.

403.2.3.2 Wall assembly materials. The face of the wall assemblies making up the enclosures for *interior exit stairways* and elevator hoistway enclosures that are not exposed to the interior of the enclosures for *interior exit stairways* or elevator hoistway enclosure shall be constructed in accordance with one of the following methods:

1. The wall assembly shall incorporate no fewer than two layers of impact-resistant construction board each of which meets or exceeds Hard Body

Impact Classification Level 2 as measured by the test method described in ASTM C1629/C1629M.

2. The wall assembly shall incorporate no fewer than one layer of impact-resistant construction material that meets or exceeds Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C1629/C1629M.
3. The wall assembly incorporates multiple layers of any material, tested in tandem, that meets or exceeds Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C1629/C1629M.

403.2.3.3 Concrete and masonry walls. Concrete or masonry walls shall be deemed to satisfy the requirements of Sections 403.2.3.1 and 403.2.3.2.

403.2.3.4 Other wall assemblies. Any other wall assembly that provides impact resistance equivalent to that required by Sections 403.2.3.1 and 403.2.3.2 for Hard Body Impact Classification Level 3, as measured by the test method described in ASTM C1629/C1629M, shall be permitted.

403.2.4 Sprayed fire-resistant materials (SFRM). The bond strength of the SFRM installed throughout the building shall be in accordance with Table 403.2.4.

**TABLE 403.2.4
MINIMUM BOND STRENGTH**

| HEIGHT OF BUILDING ^a | SFRM MINIMUM BOND STRENGTH |
|---------------------------------|----------------------------|
| Up to 420 feet | 430 psf |
| Greater than 420 feet | 1,000 psf |

For SI: 1 foot = 304.8 mm, 1 pound per square foot (psf) = 0.0479 kW/m².

a. Above the lowest level of fire department vehicle access.

403.3 Automatic sprinkler system. Buildings and structures shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 and a secondary water supply where required by Section 403.3.3.

Exception: An *automatic sprinkler system* shall not be required in spaces or areas of:

1. *Open parking garages* in accordance with Section 406.5.
2. Telecommunications equipment buildings used exclusively for telecommunications equipment, associated electrical power distribution equipment, batteries and standby engines, provided that those spaces or areas are equipped throughout with an automatic fire detection system in accordance with Section 907.2 and are separated from the remainder of the building by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or not less than 2-hour *horizontal assemblies* constructed in accordance with Section 711, or both.

403.3.1 Number of sprinkler risers and system design. Each sprinkler system zone in buildings that are more than 420 feet (128 000 mm) in *building height* shall be supplied by no fewer than two risers. Each riser shall supply sprin-

klers on alternate floors. If more than two risers are provided for a zone, sprinklers on adjacent floors shall not be supplied from the same riser.

403.3.1.1 Riser location. Sprinkler risers shall be placed in *interior exit stairways* and ramps that are remotely located in accordance with Section 1007.1.

403.3.2 Water supply to required fire pumps. In buildings that are more than 420 feet (128 000 mm) in *building height*, required fire pumps shall be supplied by connections to no fewer than two water mains located in different streets. Separate supply piping shall be provided between each connection to the water main and the pumps. Each connection and the supply piping between the connection and the pumps shall be sized to supply the flow and pressure required for the pumps to operate.

Exception: Two connections to the same main shall be permitted provided the main is valved such that an interruption can be isolated so that the water supply will continue without interruption through no fewer than one of the connections.

403.3.3 Secondary water supply. An automatic secondary on-site water supply having a capacity not less than the hydraulically calculated sprinkler demand, including the hose stream requirement, shall be provided for *high-rise buildings* assigned to Seismic Design Category C, D, E or F as determined by Section 1613. An additional fire pump shall not be required for the secondary water supply unless needed to provide the minimum design intake pressure at the suction side of the fire pump supplying the *automatic sprinkler system*. The secondary water supply shall have a duration of not less than 30 minutes.

403.3.4 Fire pump room. Fire pumps shall be located in rooms protected in accordance with Section 913.2.1.

403.4 Emergency systems. The detection, alarm and emergency systems of *high-rise buildings* shall comply with Sections 403.4.1 through 403.4.8.

403.4.1 Smoke detection. Smoke detection shall be provided in accordance with Section 907.2.13.1.

403.4.2 Fire alarm system. A *fire alarm system* shall be provided in accordance with Section 907.2.13.

403.4.3 Standpipe system. A *high-rise building* shall be equipped with a standpipe system as required by Section 905.3.

403.4.4 Emergency voice/alarm communication system. An *emergency voice/alarm communication system* shall be provided in accordance with Section 907.5.2.2.

403.4.5 Emergency responder radio coverage. Emergency responder radio coverage shall be provided in accordance with Section 510 of the *Fire Code*.

403.4.6 Fire command. A *fire command center* complying with Section 911 shall be provided in a location approved by the fire department.

403.4.7 Smoke removal. To facilitate smoke removal in post-fire salvage and overhaul operations, buildings and

structures shall be equipped with natural or mechanical *ventilation* for removal of products of combustion in accordance with one of the following:

1. Easily identifiable, manually operable windows or panels shall be distributed around the perimeter of each floor at not more than 50-foot (15 240 mm) intervals. The area of operable windows or panels shall be not less than 40 square feet (3.7 m²) per 50 linear feet (15 240 mm) of perimeter.

Exceptions:

1. In Group R-1 occupancies, each *sleeping unit* or suite having an *exterior wall* shall be permitted to be provided with 2 square feet (0.19 m²) of venting area in lieu of the area specified in Item 1.
2. Windows shall be permitted to be fixed provided that glazing can be cleared by fire fighters.
2. Mechanical air-handling equipment providing one exhaust air change every 15 minutes for the area involved. Return and exhaust air shall be moved directly to the outside without recirculation to other portions of the building.
3. Any other *approved* design that will produce equivalent results.

403.4.8 Standby and emergency power. A standby power system complying with Section 2702 and Section 3003 shall be provided for the standby power loads specified in Section 403.4.8.3. An emergency power system complying with Section 2702 shall be provided for the emergency power loads specified in Section 403.4.8.4.

403.4.8.1 Equipment room. If the standby or emergency power system includes a generator set inside a building, the system shall be located in a separate room enclosed with 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. System supervision with manual start and transfer features shall be provided at the *fire command center*.

Exception: In Group I-2, Condition 2, manual start and transfer features for the critical branch of the emergency power are not required to be provided at the *fire command center*.

403.4.8.2 Fuel line piping protection. Fuel lines supplying a generator set inside a building shall be separated from areas of the building other than the room the generator is located in by an approved method or assembly that has a fire-resistance rating of not less than 2 hours. Where the building is protected throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2, the required fire-resistance rating shall be reduced to 1 hour.

403.4.8.3 Standby power loads. The following are classified as standby power loads:

1. Power and lighting for the *fire command center* required by Section 403.4.6.

2. *Ventilation* and automatic fire detection equipment for *smokeproof enclosures*.
3. Elevators.
4. Where elevators are provided in a *high-rise building* for *accessible means of egress*, fire service access or occupant self-evacuation, the standby power system shall also comply with Sections 1009.4, 3007 or 3008, as applicable.

403.4.8.4 Emergency power loads. The following are classified as emergency power loads:

1. Exit signs and *means of egress* illumination required by Chapter 10.
2. Elevator car lighting.
3. *Emergency voice/alarm communications systems*.
4. Automatic fire detection systems.
5. *Fire alarm* systems.
6. Electrically powered fire pumps.

403.5 Means of egress and evacuation. The *means of egress* in *high-rise buildings* shall comply with Sections 403.5.1 through 403.5.6.

403.5.1 Remoteness of interior exit stairways. Required *interior exit stairways* shall be separated by a distance not less than 30 feet (9144 mm) or not less than one-fourth of the length of the maximum overall diagonal dimension of the building or area to be served, whichever is less. The distance shall be measured in a straight line between the nearest points of the enclosure surrounding the *interior exit stairways*. In buildings with three or more *interior exit stairways*, no fewer than two of the *interior exit stairways* shall comply with this section. Interlocking or *scissor stairways* shall be counted as one *interior exit stairway*.

403.5.2 Additional interior exit stairway. For buildings other than Group R-2 that are more than 420 feet (128 000 mm) in *building height*, one additional *interior exit stairway* meeting the requirements of Sections 1011 and 1023 shall be provided in addition to the minimum number of *exits* required by Section 1006.3. The total width of any combination of remaining *interior exit stairways* with one *interior exit stairway* removed shall be not less than the total width required by Section 1005.1. *Scissor stairways* shall not be considered the additional *interior exit stairway* required by this section.

Exception: An additional *interior exit stairway* shall not be required to be installed in buildings having elevators used for occupant self-evacuation in accordance with Section 3008.

403.5.3 Stairway door operation. *Stairway* doors other than the *exit discharge* doors shall be permitted to be locked from the *stairway* side. *Stairway* doors that are locked from the *stairway* side shall be capable of being unlocked simultaneously without unlatching upon a signal from the *fire command center*.

403.5.3.1 Stairway communication system. A telephone or other two-way communications system con-

nected to an *approved constantly attended station* shall be provided at not less than every fifth floor in each *stairway* where the doors to the *stairway* are locked.

403.5.4 Smokeproof enclosures. Every required *interior exit stairway* serving floors more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access shall be a *smokeproof enclosure* in accordance with Sections 909.20 and 1023.11.

403.5.5 Luminous egress path markings. Luminous egress path markings shall be provided in accordance with Section 1025.

403.5.6 Emergency escape and rescue. Emergency escape and rescue openings specified in Section 1030 are not required.

403.6 Elevators. Elevator installation and operation in *high-rise buildings* shall comply with Chapter 30 and Sections 403.6.1 and 403.6.2.

403.6.2 Occupant evacuation elevators. Where installed in accordance with Section 3008, passenger elevators for general public use shall be permitted to be used for occupant self-evacuation.

SECTION 404 ATRIUMS

404.1 General. In other than Group H occupancies, and where permitted by Section 712.1.7, the provisions of Sections 404.1 through 404.10 shall apply to buildings or structures containing vertical openings defined as "Atriums."

404.1.1 Definition. The following term is defined in Chapter 2:

ATRIUM.

404.2 Use. The floor of the *atrium* shall not be used for other than low fire hazard uses and only *approved* materials and decorations in accordance with the *Fire Code* shall be used in the *atrium* space.

Exception: The *atrium* floor area is permitted to be used for any *approved* use where the individual space is provided with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

404.3 Automatic sprinkler protection. An *approved automatic sprinkler system* shall be installed throughout the entire building.

Exceptions:

1. That area of a building adjacent to or above the *atrium* need not be sprinklered provided that portion of the building is separated from the *atrium* portion by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.
2. Where the ceiling of the *atrium* is more than 55 feet (16 764 mm) above the floor, sprinkler protection at the ceiling of the *atrium* is not required.

404.4 Fire alarm system. A *fire alarm system* shall be provided in accordance with Section 907.2.14.

404.5 Smoke control. A smoke control system shall be installed in accordance with Section 909.

Exceptions:

1. Except for Group I-2 and Group I-1, Condition 2, smoke control is not required for atriums that connect only two *stories*.
2. Except for Group I-2 and Group I-1, Condition 2, smoke control is not required for atriums where all exit access above the lowest level of the atrium is separated from the atrium in accordance with Section 404.6. Exception 3 to Section 404.6 shall not apply.

404.6 Enclosure of atriums. *Atrium* spaces shall be separated from adjacent spaces by a 1-hour *fire barrier* constructed in accordance with Section 707 or a *horizontal assembly* constructed in accordance with Section 711, or both.

Exceptions:

1. A *fire barrier* is not required where a glass wall forming a smoke partition is provided. The glass wall shall comply with all of the following:
 - 1.1. Automatic sprinklers are provided along both sides of the separation wall and doors, or on the room side only if there is not a walkway on the *atrium* side. The sprinklers shall be located between 4 inches and 12 inches (102 mm and 305 mm) away from the glass and at intervals along the glass not greater than 6 feet (1829 mm). The sprinkler system shall be designed so that the entire surface of the glass is wet upon activation of the sprinkler system without obstruction;
 - 1.2. The glass wall shall be installed in a gasketed frame in a manner that the framing system deflects without breaking (loading) the glass before the sprinkler system operates; and
 - 1.3. Where glass doors are provided in the glass wall, they shall be either *self-closing* or automatic-closing.
2. A *fire barrier* is not required where a glass-block wall assembly complying with Section 2110 and having a $\frac{3}{4}$ -hour *fire protection rating* is provided.
3. A *fire barrier* is not required between the *atrium* and the adjoining spaces of any three floors of the *atrium* provided such spaces are accounted for in the design of the smoke control system.

404.7 Standby power. Equipment required to provide smoke control shall be provided with standby power in accordance with Section 909.11.

404.8 Interior finish. The *interior finish* of walls and ceilings of the *atrium* shall be not less than Class B with no reduction in class for sprinkler protection.

404.9 Exit access travel distance. *Exit access* travel distance for areas open to an *atrium* shall comply with the requirements of this section.

404.9.1 Egress not through the atrium. Where required access to the *exits* is not through the *atrium*, *exit access* travel distance shall comply with Section 1017.

404.9.2 Exit access travel distance at the level of exit discharge. Where the path of egress travel is through an *atrium* space, *exit access* travel distance at the *level of exit discharge* shall be determined in accordance with Section 1017.

404.9.3 Exit access travel distance at other than the level of exit discharge. Where the path of egress travel is not at the *level of exit discharge* from the *atrium*, that portion of the total permitted *exit access* travel distance that occurs within the *atrium* shall be not greater than 200 feet (60 960 mm).

404.10 Interior exit stairways. A maximum of 50 percent of *interior exit stairways* are permitted to egress through an *atrium* on the *level of exit discharge* in accordance with Section 1028.

SECTION 405 UNDERGROUND BUILDINGS

405.1 General. The provisions of Sections 405.2 through 405.9 apply to building spaces having a floor level used for human occupancy more than 30 feet (9144 mm) below the finished floor of the lowest *level of exit discharge*.

Exceptions: The provisions of Section 405 are not applicable to the following buildings or portions of buildings:

1. One- and two-family *dwelling*s, sprinklered in accordance with Section 903.3.1.3.
2. Parking garages provided with *automatic sprinkler systems* in compliance with Section 405.3.
3. Fixed guideway transit systems.
4. *Grandstands*, *bleachers*, stadiums, arenas and similar facilities.
5. Where the lowest *story* is the only *story* that would qualify the building as an underground building and has an area not greater than 1,500 square feet (139 m²) and has an *occupant load* less than 10.
6. Pumping stations and other similar mechanical spaces intended only for limited periodic use by service or maintenance personnel.

405.2 Construction requirements. The underground portion of the building shall be of Type I construction.

405.3 Automatic sprinkler system. The highest *level of exit discharge* serving the underground portions of the building and all levels below shall be equipped with an *automatic sprinkler system* installed in accordance with Section

903.3.1.1. Water-flow switches and control valves shall be supervised in accordance with Section 903.4.

405.4 Compartmentation. Compartmentation shall be in accordance with Sections 405.4.1 through 405.4.3.

405.4.1 Number of compartments. A building having a floor level more than 60 feet (18 288 mm) below the finished floor of the lowest *level of exit discharge* shall be divided into no fewer than two compartments of approximately equal size. Such compartmentation shall extend through the highest *level of exit discharge* serving the underground portions of the building and all levels below.

Exception: The lowest *story* need not be compartmented where the area is not greater than 1,500 square feet (139 m²) and has an *occupant load* of less than 10.

405.4.2 Smoke barrier penetration. The compartments shall be separated from each other by a *smoke barrier* in accordance with Section 709. Penetrations between the two compartments shall be limited to plumbing and electrical piping and conduit that are firestopped in accordance with Section 714. Doorways shall be protected by *fire door assemblies* that are automatic-closing by smoke detection in accordance with Section 716.5.9.3 and are installed in accordance with NFPA 105 and Section 716.5.3. Where provided, each compartment shall have an air supply and an exhaust system independent of the other compartments.

405.4.3 Elevators. Where elevators are provided, each compartment shall have direct access to an elevator. Where an elevator serves more than one compartment, an elevator lobby shall be provided and shall be separated from each compartment by a *smoke barrier* in accordance with Section 709. Doors shall be gasketed, have a drop sill and be automatic-closing by smoke detection in accordance with Section 716.5.9.3.

405.5 Smoke control system. A smoke control system shall be provided in accordance with Sections 405.5.1 and 405.5.2.

405.5.1 Control system. A smoke control system is required to control the migration of products of combustion in accordance with Section 909 and the provisions of this section. Smoke control shall restrict movement of smoke to the general area of fire origin and maintain *means of egress* in a usable condition.

405.5.2 Compartment smoke control system. Where compartmentation is required, each compartment shall have an independent smoke control system. The system shall be automatically activated and capable of manual operation in accordance with Sections 907.2.18 and 907.2.19.

405.6 Fire alarm systems. A *fire alarm* system shall be provided where required by Sections 907.2.18 and 907.2.19.

405.7 Means of egress. *Means of egress* shall be in accordance with Sections 405.7.1 and 405.7.2.

405.7.1 Number of exits. Each floor level shall be provided with no fewer than two *exits*. Where compartmentation is required by Section 405.4, each compartment shall have no fewer than one *exit* and shall also have no fewer

than one *exit access* doorway into the adjoining compartment.

405.7.2 Smokeproof enclosure. Every required *stairway* serving floor levels more than 30 feet (9144 mm) below the finished floor of its *level of exit discharge* shall comply with the requirements for a *smokeproof enclosure* as provided in Section 1023.11.

405.8 Standby and emergency power. A standby power system complying with Section 2702 shall be provided for the standby power loads specified in Section 405.8.1. An emergency power system complying with Section 2702 shall be provided for the emergency power loads specified in Section 405.8.2.

405.8.1 Standby power loads. The following loads are classified as standby power loads:

1. Smoke control system.
2. *Ventilation* and automatic fire detection equipment for *smokeproof enclosures*.
3. Fire pumps.
4. Elevators, as required in Section 3003.

405.8.2 Emergency power loads. The following loads are classified as emergency power loads:

1. *Emergency voice/alarm communications systems*.
2. *Fire alarm* systems.
3. Automatic fire detection systems.
4. Elevator car lighting.
5. *Means of egress* and exit sign illumination as required by Chapter 10.

405.9 Standpipe system. The underground building shall be equipped throughout with a standpipe system in accordance with Section 905.

SECTION 406

MOTOR-VEHICLE-RELATED OCCUPANCIES

406.1 General. Motor-vehicle-related occupancies shall comply with Sections 406.1 through 406.8.

406.2 Definitions. The following terms are defined in Chapter 2:

MECHANICAL-ACCESS OPEN PARKING GARAGES.

OPEN PARKING GARAGE.

PRIVATE GARAGE.

RAMP-ACCESS OPEN PARKING GARAGES.

406.3 Private garages and carports. Private garages and carports shall comply with Sections 406.3.1 through 406.3.6.

406.3.1 Classification. Private garages and carports shall be classified as Group U occupancies. Each private garage shall be not greater than 1,000 square feet (93 m²) in area. Multiple private garages are permitted in a building where each private garage is separated from the other private garages by 1-hour *fire barriers* in accordance with Section

707, or 1-hour *horizontal assemblies* in accordance with Section 711, or both.

406.3.2 Clear height. In private garages and carports, the clear height in vehicle and pedestrian traffic areas shall be not less than 7 feet (2134 mm). Vehicle and pedestrian areas accommodating van-accessible parking shall comply with Section 1106.5.

406.3.3 Garage floor surfaces. Garage floor surfaces shall be of *approved* noncombustible material. The area of floor used for parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway.

406.3.4 Separation. For other than private garages adjacent to dwelling units, the separation of private garages from other occupancies shall comply with Section 508. Separation of private garages from *dwelling units* shall comply with Sections 406.3.4.1 through 406.3.4.3.

406.3.4.1 Dwelling unit separation. The private garage shall be separated from the *dwelling unit* and its *attic* area by means of gypsum board, not less than 1/2 inch (12.7 mm) in thickness, applied to the garage side. Garages beneath habitable rooms shall be separated from all habitable rooms above by not less than a 5/8-inch (15.9 mm) Type X gypsum board or equivalent and 1/2-inch (12.7 mm) gypsum board applied to structures supporting the separation from habitable rooms above the garage. Door openings between a private garage and the *dwelling unit* shall be equipped with either solid wood doors or solid or honeycomb core steel doors not less than 1 3/8 inches (34.9 mm) in thickness, or doors in compliance with Section 716.5.3 with a fire protection rating of not less than 20 minutes. Doors shall be *self-closing* and self-latching.

406.3.4.2 Openings prohibited. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted.

406.3.4.3 Ducts. Ducts in a private garage and ducts penetrating the walls or ceilings separating the *dwelling unit* from the garage, including its *attic* area, shall be constructed of sheet steel of not less than 0.019 inch (0.48 mm) in thickness and shall have no openings into the garage.

406.3.5 Carports. Carports shall be open on at least two sides. Carport floor surfaces shall be of an *approved* noncombustible material. Carports not open on at least two sides shall be considered a garage and shall comply with the requirements for private garages.

Exception: Asphalt surfaces shall be permitted at ground level in carports.

The area of floor used for parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway.

406.3.5.1 Carport separation. A separation is not required between a Group R-3 and U carport, provided the carport is entirely open on two or more sides and there are not enclosed areas above.

406.3.6 Automatic garage door openers. Automatic garage door openers, where provided, shall be *listed* in accordance with UL 325.

406.4 Public parking garages. Parking garages, other than *private garages*, shall be classified as public parking garages and shall comply with the provisions of Sections 406.4.2 through 406.4.8 and shall be classified as either an *open parking garage* or an enclosed parking garage. *Open parking garages* shall also comply with Section 406.5. Enclosed parking garages shall also comply with Section 406.6. See Section 510 for special provisions for parking garages.

406.4.1 Clear height. The clear height of each floor level in vehicle and pedestrian traffic areas shall be not less than 7 feet (2134 mm). Vehicle and pedestrian areas accommodating van-accessible parking shall comply with Section 1106.5.

406.4.2 Guards. Guards shall be provided in accordance with Section 1015. Guards serving as *vehicle barriers* shall comply with Sections 406.4.3 and 1015.

406.4.3 Vehicle barriers. *Vehicle barriers* not less than 2 feet 9 inches (835 mm) in height shall be placed where the vertical distance from the floor of a drive lane or parking space to the ground or surface directly below is greater than 1 foot (305 mm). *Vehicle barriers* shall comply with the loading requirements of Section 1607.8.3.

Exception: *Vehicle barriers* are not required in vehicle storage compartments in a mechanical access parking garage.

406.4.4 Ramps. Vehicle ramps shall not be considered as required *exits* unless pedestrian facilities are provided. Vehicle ramps that are utilized for vertical circulation as well as for parking shall not exceed a slope of 1:15 (6.67 percent).

406.4.5 Floor surface. Parking surfaces shall be of concrete or similar noncombustible and nonabsorbent materials.

The area of floor used for parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway.

Exceptions:

1. Asphalt parking surfaces shall be permitted at ground level.
2. Floors of Group S-2 parking garages shall not be required to have a sloped surface.

406.4.6 Mixed occupancy separation. Parking garages shall be separated from other occupancies in accordance with Section 508.1.

406.4.7 Special hazards. Connection of a parking garage with any room in which there is a fuel-fired appliance shall be by means of a vestibule providing a two-doorway separation.

Exception: A single door shall be allowed provided the sources of ignition in the appliance are not less than 18 inches (457 mm) above the floor.

406.4.8 Attached to rooms. Openings from a parking garage directly into a room used for sleeping purposes shall not be permitted.

406.5 Open parking garages. *Open parking garages* shall comply with Sections 406.5.1 through 406.5.11.

406.5.1 Construction. *Open parking garages* shall be of Type I, II or IV construction. *Open parking garages* shall meet the design requirements of Chapter 16. For *vehicle barriers*, see Section 406.4.3.

406.5.2 Openings. For natural *ventilation* purposes, the exterior side of the structure shall have uniformly distributed openings on two or more sides. The area of such openings in *exterior walls* on a tier shall be not less than 20 percent of the total perimeter wall area of each tier. The aggregate length of the openings considered to be providing natural *ventilation* shall be not less than 40 percent of the perimeter of the tier. Interior walls shall be not less than 20 percent open with uniformly distributed openings.

Exception: Openings are not required to be distributed over 40 percent of the building perimeter where the required openings are uniformly distributed over two opposing sides of the building.

406.5.2.1 Openings below grade. Where openings below grade provide required natural *ventilation*, the outside horizontal clear space shall be one and one-half times the depth of the opening. The width of the horizontal clear space shall be maintained from grade down to the bottom of the lowest required opening.

406.5.3 Uses. Mixed uses shall be allowed in the same building as an *open parking garage* subject to the provisions of Sections 402.4.2.3, 406.5.11, 508.1, 510.3, 510.4 and 510.7.

406.5.4 Area and height. Area and height of *open parking garages* shall be limited as set forth in Chapter 5 for Group S-2 occupancies and as further provided for in Section 508.1.

406.5.4.1 Single use. Where the *open parking garage* is used exclusively for the parking or storage of private motor vehicles, with no other uses in the building, the area and height shall be permitted to comply with Table 406.5.4, along with increases allowed by Section 406.5.5.

Exception: The grade-level tier is permitted to contain an office, waiting and toilet rooms having a total combined area of not more than 1,000 square feet (93 m²). Such area need not be separated from the *open parking garage*.

In *open parking garages* having a spiral or sloping floor, the horizontal projection of the structure at any cross section shall not exceed the allowable area per parking tier. In the case of an *open parking garage* having a continuous spiral floor, each 9 feet 6 inches (2896 mm) of height, or portion thereof, shall be considered a tier.

**TABLE 406.5.4
OPEN PARKING GARAGES AREA AND HEIGHT**

| TYPE OF CONSTRUCTION | AREA PER TIER (square feet) | HEIGHT (in tiers) | | |
|----------------------|--------------------------------|-------------------|----------------------------|-----------|
| | | Ramp access | Mechanical access | |
| | | | Automatic sprinkler system | |
| | | | No | Yes |
| IA | Unlimited | Unlimited | Unlimited | Unlimited |
| IB | Unlimited | 12 tiers | 12 tiers | 18 tiers |
| IIA | 50,000 | 10 tiers | 10 tiers | 15 tiers |
| IIB | 50,000 | 8 tiers | 8 tiers | 12 tiers |
| IV | 50,000 | 4 tiers | 4 tiers | 4 tiers |

For SI: 1 square foot = 0.0929 m².

The clear height of a parking tier shall be not less than 7 feet (2134 mm), except that a lower clear height is permitted in mechanical-access *open parking garages* where approved by the building official.

406.5.5 Area and height increases. The allowable area and height of *open parking garages* shall be increased in accordance with the provisions of this section. Garages with sides open on three-fourths of the building's perimeter are permitted to be increased by 25 percent in area and one tier in height. Garages with sides open around the entire building's perimeter are permitted to be increased by 50 percent in area and one tier in height. For a side to be considered open under the above provisions, the total area of openings along the side shall not be less than 50 percent of the interior area of the side at each tier and such openings shall be equally distributed along the length of the tier. For purposes of calculating the interior area of the side, the height shall not exceed 7 feet (2134 mm).

Allowable tier areas in Table 406.5.4 shall be increased for *open parking garages* constructed to heights less than the table maximum. The gross tier area of the garage shall not exceed that permitted for the higher structure. No fewer than three sides of each such larger tier shall have continuous horizontal openings not less than 30 inches (762 mm) in clear height extending for not less than 80 percent of the length of the sides and no part of such larger tier shall be more than 200 feet (60 960 mm) horizontally from such an opening. In addition, each such opening shall face a street or yard accessible to a street with a width of not less than 30 feet (9144 mm) for the full length of the opening, and standpipes shall be provided in each such tier.

Open parking garages of Type II construction, with all sides open, shall be unlimited in allowable area where the building height does not exceed 75 feet (22 860 mm). For a side to be considered open, the total area of openings along the side shall be not less than 50 percent of the interior area of the side at each tier and such openings shall be equally distributed along the length of the tier. For purposes of calculating the interior area of the side, the height shall not exceed 7 feet (2134 mm). All portions of tiers shall be within 200 feet (60 960 mm) horizontally from such openings or other natural ventilation openings as defined in Section 406.5.2. These openings shall be permitted to be provided in courts with a minimum dimen-

sion of 20 feet (6096 mm) for the full width of the openings.

406.5.6 Fire separation distance. Exterior walls and openings in exterior walls shall comply with Tables 601 and 602. The distance to an adjacent lot line shall be determined in accordance with Table 602 and Section 705.

406.5.7 Means of egress. Where persons other than parking attendants are permitted, *open parking garages* shall meet the means of egress requirements of Chapter 10. Where no persons other than parking attendants are permitted, there shall be no fewer than two exit stairways. Each exit stairway shall be not less than 36 inches (914 mm) in width. Lifts shall be permitted to be installed for use of employees only, provided they are completely enclosed by noncombustible materials.

406.5.8 Standpipe system. An *open parking garage* shall be equipped with a standpipe system as required by Section 905.3.

406.5.9 Enclosure of vertical openings. Enclosure shall not be required for vertical openings except as specified in Section 406.5.7.

406.5.10 Ventilation. Ventilation, other than the percentage of openings specified in Section 406.5.2, shall not be required.

406.5.11 Prohibitions. The following uses and alterations are not permitted:

1. Vehicle repair work.
2. Parking of buses, trucks and similar vehicles.
3. Partial or complete closing of required openings in exterior walls by tarpaulins or any other means.
4. Dispensing of fuel.

406.6 Enclosed parking garages. Enclosed parking garages shall comply with Sections 406.6.1 through 406.6.3.

406.6.1 Heights and areas. Enclosed vehicle parking garages and portions thereof that do not meet the definition of *open parking garages* shall be limited to the allowable heights and areas specified in Sections 504 and 506 as modified by Section 507. Roof parking is permitted.

406.6.2 Ventilation. A mechanical ventilation system shall be provided in accordance with the Mechanical Code.

406.6.3 Automatic sprinkler system. An enclosed parking garage shall be equipped with an *automatic sprinkler system* in accordance with Section 903.2.10.

406.7 Motor fuel-dispensing facilities. Motor fuel-dispensing facilities shall comply with the *Fire Code* and Sections 406.7.1 and 406.7.2.

406.7.1 Vehicle fueling pad. The vehicle shall be fueled on noncoated concrete or other *approved* paving material having a resistance not exceeding 1 megohm as determined by the methodology in EN 1081.

406.7.2 Canopies. Canopies under which fuels are dispensed shall have a clear, unobstructed height of not less than 13 feet 6 inches (4115 mm) to the lowest projecting element in the vehicle drive-through area. Canopies and their supports over pumps shall be of noncombustible materials, *fire-retardant-treated wood* complying with Chapter 23, wood of Type IV sizes or of construction providing 1-hour *fire resistance*. Combustible materials used in or on a *canopy* shall comply with one of the following:

1. Shielded from the pumps by a noncombustible element of the *canopy*, or wood of Type IV sizes;
2. Plastics covered by aluminum facing having a thickness of not less than 0.010 inch (0.30 mm) or corrosion-resistant steel having a base metal thickness of not less than 0.016 inch (0.41 mm). The plastic shall have a *flame spread index* of 25 or less and a smoke-developed index of 450 or less when tested in the form intended for use in accordance with ASTM E84 or UL 723 and a self-ignition temperature of 650°F (343°C) or greater when tested in accordance with ASTM D1929; or
3. Panels constructed of light-transmitting plastic materials shall be permitted to be installed in *canopies* erected over motor vehicle fuel-dispensing station fuel dispensers, provided the panels are located not less than 10 feet (3048 mm) from any building on the same *lot* and face *yards* or streets not less than 40 feet (12 192 mm) in width on the other sides. The aggregate areas of plastics shall be not greater than 1,000 square feet (93 m²). The maximum area of any individual panel shall be not greater than 100 square feet (9.3 m²).

406.7.2.1 Canopies used to support gaseous hydrogen systems. *Canopies* that are used to shelter dispensing operations where flammable compressed gases are located on the roof of the *canopy* shall be in accordance with the following:

1. The *canopy* shall meet or exceed Type I construction requirements.
2. Operations located under *canopies* shall be limited to refueling only.
3. The *canopy* shall be constructed in a manner that prevents the accumulation of hydrogen gas.

406.8 Repair garages. Repair garages shall be constructed in accordance with the *Fire Code* and Sections 406.8.1

through 406.8.6. This occupancy shall not include motor fuel-dispensing facilities, as regulated in Section 406.7.

406.8.1 Mixed uses. Mixed uses shall be allowed in the same building as a repair garage subject to the provisions of Section 508.1.

406.8.2 Ventilation. Repair garages shall be mechanically ventilated in accordance with the *Mechanical Code*. The *ventilation* system shall be controlled at the entrance to the garage.

406.8.3 Floor surface. Repair garage floors shall be of concrete or similar noncombustible and nonabsorbent materials.

Exception: Slip-resistant, nonabsorbent, *interior floor finishes* having a critical radiant flux not more than 0.45 W/cm², as determined by NFPA 253, shall be permitted.

406.8.4 Heating equipment. Heating equipment shall be installed in accordance with the *Mechanical Code*.

406.8.5 Gas detection system. Repair garages used for the repair of vehicles fueled by nonodorized gases such as hydrogen and nonodorized LNG, shall be provided with a flammable gas detection system.

406.8.5.1 System design. The flammable gas detection system shall be *listed* or *approved* and shall be calibrated to the types of fuels or gases used by vehicles to be repaired. The gas detection system shall be designed to activate when the level of flammable gas exceeds 25 percent of the lower flammable limit (LFL). Gas detection shall be provided in lubrication or chassis service pits of repair garages used for repairing nonodorized LNG-fueled vehicles.

406.8.5.1.1 Gas detection system components. Gas detection system control units shall be *listed* and *labeled* in accordance with UL 864 or UL 2017. Gas detectors shall be *listed* and *labeled* in accordance with UL 2075 for use with the gases and vapors being detected.

406.8.5.2 Operation. Activation of the gas detection system shall result in all of the following:

1. Initiation of distinct audible and visual alarm signals in the repair garage.
2. Deactivation of all heating systems located in the repair garage.
3. Activation of the mechanical *ventilation* system, where the system is interlocked with gas detection.

406.8.5.3 Failure of the gas detection system. Failure of the gas detection system shall result in the deactivation of the heating system, activation of the mechanical *ventilation* system where the system is interlocked with the gas detection system and cause a trouble signal to sound in an *approved* location.

406.8.6 Automatic sprinkler system. A repair garage shall be equipped with an *automatic sprinkler system* in accordance with Section 903.2.9.1.

SECTION 407

GROUP I-2

407.1 General. Occupancies in Group I-2 shall comply with the provisions of Sections 407.1 through 407.10 and other applicable provisions of this code.

407.2 Corridors continuity and separation. *Corridors* in occupancies in Group I-2 shall be continuous to the *exits* and shall be separated from other areas in accordance with Section 407.3 except spaces conforming to Sections 407.2.1 through 407.2.6.

407.2.1 Waiting and similar areas. Waiting areas and similar spaces constructed as required for *corridors* shall be permitted to be open to a *corridor*, only where all of the following criteria are met:

1. The spaces are not occupied as care recipient's sleeping rooms, treatment rooms, incidental uses in accordance with Section 509, or hazardous uses.
2. The open space is protected by an automatic fire detection system installed in accordance with Section 907.
3. The *corridors* onto which the spaces open, in the same *smoke compartment*, are protected by an automatic fire detection system installed in accordance with Section 907, or the *smoke compartment* in which the spaces are located is equipped throughout with quick-response sprinklers in accordance with Section 903.3.2.
4. The space is arranged so as not to obstruct access to the required *exits*.

407.2.2 Care providers' stations. Spaces for care providers', supervisory staff, doctors' and nurses' charting, communications and related clerical areas shall be permitted to be open to the *corridor*, where such spaces are constructed as required for *corridors*.

407.2.3 Psychiatric treatment areas. Areas wherein psychiatric care recipients who are not capable of self-preservation are housed, or group meeting or multipurpose therapeutic spaces other than incidental uses in accordance with Section 509, under continuous supervision by facility staff, shall be permitted to be open to the *corridor*, where the following criteria are met:

1. Each area does not exceed 1,500 square feet (140 m²).
2. The area is located to permit supervision by the facility staff.
3. The area is arranged so as not to obstruct any access to the required *exits*.
4. The area is equipped with an automatic fire detection system installed in accordance with Section 907.2.
5. Not more than one such space is permitted in any one *smoke compartment*.
6. The walls and ceilings of the space are constructed as required for *corridors*.

407.2.4 Gift shops. Gift shops and associated storage that are less than 500 square feet (455 m²) in area shall be permitted to be open to the *corridor* where such spaces are constructed as required for *corridors*.

407.2.5 Nursing home housing units. In Group I-2, Condition 1, occupancies, in areas where nursing home residents are housed, shared living spaces, group meeting or multipurpose therapeutic spaces shall be permitted to be open to the *corridor*, where all of the following criteria are met:

1. The walls and ceilings of the space are constructed as required for *corridors*.
2. The spaces are not occupied as resident sleeping rooms, treatment rooms, incidental uses in accordance with Section 509, or hazardous uses.
3. The open space is protected by an automatic fire detection system installed in accordance with Section 907.
4. The *corridors* onto which the spaces open, in the same *smoke compartment*, are protected by an automatic fire detection system installed in accordance with Section 907, or the *smoke compartment* in which the spaces are located is equipped throughout with quick-response sprinklers in accordance with Section 903.3.2.
5. The space is arranged so as not to obstruct access to the required *exits*.

407.2.6 Nursing home cooking facilities. In Group I-2, Condition 1, occupancies, rooms or spaces that contain a cooking facility with domestic cooking appliances shall be permitted to be open to the *corridor* where all of the following criteria are met:

1. The number of care recipients housed in the smoke compartment is not greater than 30.
2. The number of care recipients served by the cooking facility is not greater than 30.
3. Only one cooking facility area is permitted in a smoke compartment.
4. The types of domestic cooking appliances permitted are limited to ovens, cooktops, ranges, warmers and microwaves.
5. The corridor is a clearly identified space delineated by construction or floor pattern, material or color.
6. The space containing the domestic cooking facility shall be arranged so as not to obstruct access to the required exit.
7. A domestic cooking hood installed and constructed in accordance with Section 505 of the *Mechanical Code* is provided over the cooktop or range.
8. The domestic cooking hood provided over the cooktop or range shall be equipped with an auto-

matic fire-extinguishing system of a type recognized for protection of domestic cooking equipment. Preengineered automatic extinguishing systems shall be tested in accordance with UL 300A and *listed* and *labeled* for the intended application. The system shall be installed in accordance with this code, its listing and the manufacturer's instructions.

9. A manual actuation device for the hood suppression system shall be installed in accordance with Sections 904.12.1 and 904.12.2.
10. An interlock device shall be provided such that upon activation of the hood suppression system, the power or fuel supply to the cooktop or range will be turned off.
11. A shut-off for the fuel and electrical power supply to the cooking equipment shall be provided in a location that is accessible only to staff.
12. A timer shall be provided that automatically deactivates the cooking appliances within a period of not more than 120 minutes.
13. A portable fire extinguisher shall be installed in accordance with Section 906 of the *Fire Code*.

407.3 Corridor wall construction. Corridor walls shall be constructed as smoke partitions in accordance with Section 710.

407.3.1 Corridor doors. Corridor doors, other than those in a wall required to be rated by Section 509.4 or for the enclosure of a vertical opening or an *exit*, shall not have a required *fire protection rating* and shall not be required to be equipped with *self-closing* or automatic-closing devices, but shall provide an effective barrier to limit the transfer of smoke and shall be equipped with positive latching. Roller latches are not permitted. Other doors shall conform to Section 716.5.

407.4 Means of egress. Group I-2 occupancies shall be provided with means of egress complying with Chapter 10 and Sections 407.4.1 through 407.4.4. The fire safety and evacuation plans provided in accordance with Section 1001.4 shall identify the building components necessary to support a *defend-in-place* emergency response in accordance with Sections 404 and 408 of the *Fire Code*.

407.4.1 Direct access to a corridor. Habitable rooms in Group I-2 occupancies shall have an *exit access* door leading directly to a *corridor*.

Exceptions:

1. Rooms with *exit* doors opening directly to the outside at ground level.
2. Rooms arranged as *care suites* complying with Section 407.4.4.

407.4.1.1 Locking devices. Locking devices that restrict access to a care recipient's room from the *corridor* and that are operable only by staff from the *corri-*

dor side shall not restrict the *means of egress* from the care recipient's room.

Exceptions:

1. This section shall not apply to rooms in psychiatric treatment and similar care areas.
2. Locking arrangements in accordance with Section 1010.1.9.6.

407.4.2 Distance of travel. The distance of travel between any point in a Group I-2 occupancy sleeping room, not located in a *care suite*, and an *exit access* door in that room shall be not greater than 50 feet (15 240 mm).

407.4.3 Projections in nursing home corridors. In Group I-2, Condition 1, occupancies, where the corridor width is a minimum of 96 inches (2440 mm), projections shall be permitted for furniture where all of the following criteria are met:

1. The furniture is attached to the floor or to the wall.
2. The furniture does not reduce the clear width of the corridor to less than 72 inches (1830 mm) except where other encroachments are permitted in accordance with Section 1005.7.
3. The furniture is positioned on only one side of the *corridor*.
4. Each arrangement of furniture is 50 square feet (4.6 m²) maximum in area.
5. Furniture arrangements are separated by 10 feet (3048 mm) minimum.
6. Placement of furniture is considered as part of the fire and safety plans in accordance with Section 1001.4.

407.4.4 Group I-2 care suites. *Care suites* in Group I-2 shall comply with Sections 407.4.4.1 through 407.4.4.4 and either Section 407.4.4.5 or 407.4.4.6.

407.4.4.1 Exit access through care suites. *Exit* access from all other portions of a building not classified as a *care suite* shall not pass through a *care suite*. In a *care suite* required to have more than one *exit*, one *exit access* is permitted to pass through an adjacent *care suite* provided all of the other requirements of Sections 407.4 and 1016.2 are satisfied.

407.4.4.2 Separation. *Care suites* shall be separated from other portions of the building, including other *care suites*, by a smoke partition complying with Section 710.

407.4.4.3 Access to corridor. Movement from habitable rooms shall not require passage through more than three doors and 100 feet (30 480 mm) distance of travel within the suite.

Exception: The distance of travel shall be permitted to be increased to 125 feet (38 100 mm) where an automatic smoke detection system is provided throughout the *care suite* and installed in accordance with NFPA 72.

407.4.4.4 Doors within care suites. Doors in care suites serving habitable rooms shall be permitted to comply with one of the following:

1. Manually operated horizontal sliding doors permitted in accordance with Exception 9 to Section 1010.1.2.
2. Power-operated doors permitted in accordance with Exception 7 to Section 1010.1.2.
3. Means of egress doors complying with Section 1010.

407.4.4.5 Care suites containing sleeping room areas. Sleeping rooms shall be permitted to be grouped into care suites where one of the following criteria is met:

1. The *care suite* is not used as an *exit access* for more than eight care recipient beds.
2. The arrangement of the *care suite* allows for direct and constant visual supervision into the sleeping rooms by care providers.
3. An automatic smoke detection system is provided in the sleeping rooms and installed in accordance with NFPA 72.

407.4.4.5.1 Area. *Care suites* containing sleeping rooms shall be not greater than 7,500 square feet (696 m²) in area.

Exception: *Care suites* containing sleeping rooms shall be permitted to be not greater than 10,000 square feet (929 m²) in area where an automatic smoke detection system is provided throughout the *care suite* and installed in accordance with NFPA 72.

407.4.4.5.2 Exit access. Any sleeping room, or any *care suite* that contains sleeping rooms, of more than 1,000 square feet (93 m²) shall have no fewer than two *exit access* doors from the *care suite* located in accordance with Section 1007.

407.4.4.6 Care suites not containing sleeping rooms. Areas not containing sleeping rooms, but only treatment areas and the associated rooms, spaces or circulation space, shall be permitted to be grouped into *care suites* and shall conform to the limitations in Sections 407.4.4.6.1 and 407.4.4.6.2.

407.4.4.6.1 Area. *Care suites* of rooms, other than sleeping rooms, shall have an area not greater than 12,500 square feet (1161 m²).

Exception: *Care suites* not containing sleeping rooms shall be permitted to be not greater than 15,000 square feet (1394 m²) in area where an automatic smoke detection system is provided throughout the *care suite* in accordance with Section 907.

407.4.4.6.2 Exit access. *Care suites*, other than sleeping rooms, with an area of more than 2,500 square feet (232 m²) shall have no fewer than two

exit access doors from the *care suite* located in accordance with Section 1007.1.

407.5 Smoke barriers. *Smoke barriers* shall be provided to subdivide every *story* used by persons receiving care, treatment or sleeping and to divide other *stories* with an *occupant load* of 50 or more persons, into no fewer than two *smoke compartments*. Such *stories* shall be divided into *smoke compartments* with an area of not more than 22,500 square feet (2092 m²) in Group I-2, Condition 1, and not more than 40,000 square feet (3716 m²) in Group I-2, Condition 2, and the distance of travel from any point in a *smoke compartment* to a *smoke barrier* door shall be not greater than 200 feet (60 960 mm). The *smoke barrier* shall be in accordance with Section 709.

407.5.1 Refuge area. Refuge areas shall be provided within each *smoke compartment*. The size of the refuge area shall accommodate the occupants and care recipients from the adjoining *smoke compartment*. Where a *smoke compartment* is adjoined by two or more *smoke compartments*, the minimum area of the refuge area shall accommodate the largest *occupant load* of the adjoining compartments. The size of the refuge area shall provide the following:

1. Not less than 30 net square feet (2.8 m²) for each care recipient confined to bed or stretcher.
2. Not less than 6 square feet (0.56 m²) for each ambulatory care recipient not confined to bed or stretcher and for other occupants.

Areas or spaces permitted to be included in the calculation of refuge area are *corridors*, sleeping areas, treatment rooms, lounge or dining areas and other low-hazard areas.

407.5.2 Independent egress. A *means of egress* shall be provided from each *smoke compartment* created by *smoke barriers* without having to return through the *smoke compartment* from which *means of egress* originated.

407.5.3 Horizontal assemblies. *Horizontal assemblies* supporting *smoke barriers* required by this section shall be designed to resist the movement of smoke. Elevator lobbies shall be in accordance with Section 3006.2.

407.6 Automatic sprinkler system. *Smoke compartments* containing sleeping rooms shall be equipped throughout with an *automatic sprinkler* system in accordance with Sections 903.3.1.1 and 903.3.2.

407.7 Fire alarm system. A *fire alarm* system shall be provided in accordance with Section 907.2.6.

407.8 Automatic fire detection. *Corridors* in Group I-2, Condition 1 occupancies and spaces permitted to be open to the *corridors* by Section 407.2 shall be equipped with an automatic fire detection system.

Group I-2, Condition 2 occupancies shall be equipped with smoke detection as required in Section 407.2.

Exceptions:

1. *Corridor* smoke detection is not required where sleeping rooms are provided with *smoke detectors* that comply with UL 268. Such detectors shall provide a visual display on the *corridor* side of each

sleeping room and an audible and visual alarm at the care provider's station attending each unit.

2. *Corridor* smoke detection is not required where sleeping room doors are equipped with automatic door-closing devices with integral *smoke detectors* on the unit sides installed in accordance with their listing, provided that the integral detectors perform the required alerting function.

407.9 Secured yards. Grounds are permitted to be fenced and gates therein are permitted to be equipped with locks, provided that safe dispersal areas having 30 net square feet (2.8 m²) for bed and stretcher care recipients and 6 net square feet (0.56 m²) for ambulatory care recipients and other occupants are located between the building and the fence. Such provided safe dispersal areas shall be located not less than 50 feet (15 240 mm) from the building they serve.

407.10 Electrical systems. In Group I-2 occupancies, the essential electrical system for electrical components, equipment and systems shall be designed and constructed in accordance with the provisions of Chapter 27 and NFPA 99.

SECTION 408 GROUP I-3

408.1 General. Occupancies in Group I-3 shall comply with the provisions of Sections 408.1 through 408.11 and other applicable provisions of this code (see Section 308.5).

408.1.1 Definitions. The following terms are defined in Chapter 2:

CELL.

CELL TIER.

HOUSING UNIT.

SALLYPORT.

408.2 Other occupancies. Buildings or portions of buildings in Group I-3 occupancies where security operations necessitate the locking of required *means of egress* shall be permitted to be classified as a different occupancy. Occupancies classified as other than Group I-3 shall meet the applicable requirements of this code for that occupancy where provisions are made for the release of occupants at all times.

Means of egress from detention and correctional occupancies that traverse other use areas shall, as a minimum, conform to requirements for detention and correctional occupancies.

Exception: It is permissible to exit through a *horizontal exit* into other contiguous occupancies that do not conform to detention and correctional occupancy egress provisions but that do comply with requirements set forth in the appropriate occupancy, as long as the occupancy is not a Group H use.

408.3 Means of egress. Except as modified or as provided for in this section, the *means of egress* provisions of Chapter 10 shall apply.

408.3.1 Door width. Doors to resident *sleeping units* shall have a clear width of not less than 28 inches (711 mm).

408.3.2 Sliding doors. Where doors in a *means of egress* are of the horizontal-sliding type, the force to slide the door to its fully open position shall be not greater than 50 pounds (220 N) with a perpendicular force against the door of 50 pounds (220 N).

408.3.3 Guard tower doors. A hatch or trap door not less than 16 square feet (610 m²) in area through the floor and having dimensions of not less than 2 feet (610 mm) in any direction shall be permitted to be used as a portion of the *means of egress* from guard towers.

408.3.4 Spiral stairways. *Spiral stairways* that conform to the requirements of Section 1011.10 are permitted for access to and between staff locations.

408.3.5 Ships ladders. Ships ladders shall be permitted for egress from control rooms or elevated facility observation rooms in accordance with Section 1011.15.

408.3.6 Exit discharge. *Exits* are permitted to discharge into a fenced or walled courtyard. Enclosed *yards* or *courts* shall be of a size to accommodate all occupants, be located not less than 50 feet (15 240 mm) from the building and have an area of not less than 15 square feet (1.4 m²) per person.

408.3.7 Sallyports. A *sallyport* shall be permitted in a *means of egress* where there are provisions for continuous and unobstructed passage through the *sallyport* during an emergency egress condition.

408.3.8 Interior exit stairway and ramp construction. One *interior exit stairway* or *ramp* in each building shall be permitted to have glazing installed in doors and interior walls at each landing level providing access to the *interior exit stairway or ramp*, provided that the following conditions are met:

1. The *interior exit stairway or ramp* shall not serve more than four floor levels.
2. *Exit* doors shall be not less than ³/₄-hour *fire door assemblies* complying with Section 716.5.
3. The total area of glazing at each floor level shall not exceed 5,000 square inches (3.2 m²) and individual panels of glazing shall not exceed 1,296 square inches (0.84 m²).
4. The glazing shall be protected on both sides by an *automatic sprinkler system*. The sprinkler system shall be designed to wet completely the entire surface of any glazing affected by fire when actuated.
5. The glazing shall be in a gasketed frame and installed in such a manner that the framing system will deflect without breaking (loading) the glass before the sprinkler system operates.
6. Obstructions, such as curtain rods, drapery traverse rods, curtains, drapes or similar materials shall not be installed between the automatic sprinklers and the glazing.

408.4 Locks. Egress doors are permitted to be locked in accordance with the applicable use condition. Doors from a refuge area to the outside are permitted to be locked with a key in lieu of locking methods described in Section 408.4.1.

The keys to unlock the exterior doors shall be available at all times and the locks shall be operable from both sides of the door.

408.4.1 Remote release. Remote release of locks on doors in a *means of egress* shall be provided with reliable means of operation, remote from the resident living areas, to release locks on all required doors. In Occupancy Condition 3 or 4, the arrangement, accessibility and security of the release mechanisms required for egress shall be such that with the minimum available staff at any time, the lock mechanisms are capable of being released within 2 minutes.

Exception: Provisions for remote locking and unlocking of occupied rooms in Occupancy Condition 4 are not required provided that not more than 10 locks are necessary to be unlocked in order to move occupants from one smoke compartment to a refuge area within 3 minutes. The opening of necessary locks shall be accomplished with not more than two separate keys.

408.4.2 Power-operated doors and locks. Power-operated sliding doors or power-operated locks for swinging doors shall be operable by a manual release mechanism at the door. Emergency power shall be provided for the doors and locks in accordance with Section 2702.

Exceptions:

1. Emergency power is not required in facilities with 10 or fewer locks complying with the exception to Section 408.4.1.
2. Emergency power is not required where remote mechanical operating releases are provided.

408.4.3 Redundant operation. Remote release, mechanically operated sliding doors or remote release, mechanically operated locks shall be provided with a mechanically operated release mechanism at each door, or shall be provided with a redundant remote release control.

408.4.4 Relock capability. Doors remotely unlocked under emergency conditions shall not automatically relock when closed unless specific action is taken at the remote location to enable doors to relock.

408.5 Protection of vertical openings. Any vertical opening shall be protected by a *shaft enclosure* in accordance with Section 713, or shall be in accordance with Section 408.5.1.

408.5.1 Floor openings. Openings in floors within a *housing unit* are permitted without a *shaft enclosure*, provided all of the following conditions are met:

1. The entire normally occupied areas so interconnected are open and unobstructed so as to enable observation of the areas by supervisory personnel;
2. *Means of egress* capacity is sufficient for all occupants from all interconnected *cell tiers* and areas;
3. The height difference between the floor levels of the highest and lowest *cell tiers* shall not exceed 23 feet (7010 mm); and

4. Egress from any portion of the *cell tier* to an *exit* or *exit access* door shall not require travel on more than one additional floor level within the *housing unit*.

408.5.2 Shaft openings in communicating floor levels.

Where a floor opening is permitted between communicating floor levels of a *housing unit* in accordance with Section 408.5.1, plumbing chases serving vertically stacked individual *cells* contained within the *housing unit* shall be permitted without a *shaft enclosure*.

408.6 Smoke barrier. Occupancies in Group I-3 shall have *smoke barriers* complying with Sections 408.7 and 709 to divide every *story* occupied by residents for sleeping, or any other *story* having an *occupant load* of 50 or more persons, into no fewer than two *smoke compartments*.

Exception: Spaces having a direct *exit* to one of the following, provided that the locking arrangement of the doors involved complies with the requirements for doors at the *smoke barrier* for the use condition involved:

1. A *public way*.
2. A building separated from the resident housing area by a 2-hour fire-resistance-rated assembly or 50 feet (15 240 mm) of open space.
3. A secured *yard* or *court* having a holding space 50 feet (15 240 mm) from the housing area that provides 6 square feet (0.56 m²) or more of refuge area per occupant, including residents, staff and visitors.

408.6.1 Smoke compartments. The number of residents in any *smoke compartment* shall be not more than 200. The distance of travel to a door in a *smoke barrier* from any room door required as exit access shall be not greater than 150 feet (45 720 mm). The distance of travel to a door in a *smoke barrier* from any point in a room shall be not greater than 200 feet (60 960 mm).

408.6.2 Refuge area. Not less than 6 net square feet (0.56 m²) per occupant shall be provided on each side of each *smoke barrier* for the total number of occupants in adjoining *smoke compartments*. This space shall be readily available wherever the occupants are moved across the *smoke barrier* in a fire emergency.

408.6.3 Independent egress. A *means of egress* shall be provided from each *smoke compartment* created by *smoke barriers* without having to return through the *smoke compartment* from which *means of egress* originates.

408.7 Security glazing. In occupancies in Group I-3, windows and doors in 1-hour *fire barriers* constructed in accordance with Section 707, *fire partitions* constructed in accordance with Section 708 and *smoke barriers* constructed in accordance with Section 709 shall be permitted to have security glazing installed provided that the following conditions are met.

1. Individual panels of glazing shall not exceed 1,296 square inches (0.84 m²).
2. The glazing shall be protected on both sides by an *automatic sprinkler system*. The sprinkler system shall be designed to, when actuated, wet completely the entire surface of any glazing affected by fire.

3. The glazing shall be in a gasketed frame and installed in such a manner that the framing system will deflect without breaking (loading) the glass before the sprinkler system operates.
4. Obstructions, such as curtain rods, drapery traverse rods, curtains, drapes or similar materials shall not be installed between the automatic sprinklers and the glazing.

408.8 Subdivision of resident housing areas. Sleeping areas and any contiguous day room, group activity space or other common spaces where residents are housed shall be separated from other spaces in accordance with Sections 408.8.1 through 408.8.4.

408.8.1 Occupancy Conditions 3 and 4. Each sleeping area in Occupancy Conditions 3 and 4 shall be separated from the adjacent common spaces by a smoke-tight partition where the distance of travel from the sleeping area through the common space to the *corridor* exceeds 50 feet (15 240 mm).

408.8.2 Occupancy Condition 5. Each sleeping area in Occupancy Condition 5 shall be separated from adjacent sleeping areas, *corridors* and common spaces by a smoke-tight partition. Additionally, common spaces shall be separated from the *corridor* by a smoke-tight partition.

408.8.3 Openings in room face. The aggregate area of openings in a solid sleeping room face in Occupancy Conditions 2, 3, 4 and 5 shall not exceed 120 square inches (0.77 m²). The aggregate area shall include all openings including door undercuts, food passes and grilles. Openings shall be not more than 36 inches (914 mm) above the floor. In Occupancy Condition 5, the openings shall be closeable from the room side.

408.8.4 Smoke-tight doors. Doors in openings in partitions required to be smoke tight by Section 408.8 shall be substantial doors, of construction that will resist the passage of smoke. Latches and door closures are not required on *cell* doors.

408.9 Windowless buildings. For the purposes of this section, a windowless building or portion of a building is one with nonopenable windows, windows not readily breakable or without windows. Windowless buildings shall be provided with an engineered smoke control system to provide a tenable environment for exiting from the *smoke compartment* in the area of fire origin in accordance with Section 909 for each windowless *smoke compartment*.

408.10 Fire alarm system. A *fire alarm* system shall be provided in accordance with Section 907.2.6.3.

408.11 Automatic sprinkler system. Group I-3 occupancies shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.2.6.

SECTION 409 MOTION PICTURE PROJECTION ROOMS

409.1 General. The provisions of Sections 409.1 through 409.5 shall apply to rooms in which ribbon-type cellulose acetate or other safety film is utilized in conjunction with

electric arc, xenon or other light-source projection equipment that develops hazardous gases, dust or radiation. Where cellulose nitrate film is utilized or stored, such rooms shall comply with NFPA 40.

409.1.1 Projection room required. Every motion picture machine projecting film as mentioned within the scope of this section shall be enclosed in a projection room. Appurtenant electrical equipment, such as rheostats, transformers and generators, shall be within the projection room or in an adjacent room of equivalent construction.

409.2 Construction of projection rooms. Every projection room shall be of permanent construction consistent with the construction requirements for the type of building in which the projection room is located. Openings are not required to be protected.

The room shall have a floor area of not less than 80 square feet (7.44 m²) for a single machine and not less than 40 square feet (3.7 m²) for each additional machine. Each motion picture projector, floodlight, spotlight or similar piece of equipment shall have a clear working space of not less than 30 inches by 30 inches (762 mm by 762 mm) on each side and at the rear thereof, but only one such space shall be required between two adjacent projectors. The projection room and the rooms appurtenant thereto shall have a ceiling height of not less than 7 feet 6 inches (2286 mm). The aggregate of openings for projection equipment shall not exceed 25 percent of the area of the wall between the projection room and the auditorium. Openings shall be provided with glass or other *approved* material, so as to close completely the opening.

409.3 Projection room and equipment ventilation. *Ventilation* shall be provided in accordance with the *Mechanical Code*.

409.3.1 Supply air. Each projection room shall be provided with adequate air supply inlets so arranged as to provide well-distributed air throughout the room. Air inlet ducts shall provide an amount of air equivalent to the amount of air being exhausted by projection equipment. Air is permitted to be taken from the outside; from adjacent spaces within the building, provided the volume and infiltration rate is sufficient; or from the building air-conditioning system, provided it is so arranged as to provide sufficient air when other systems are not in operation.

409.3.2 Exhaust air. Projection rooms are permitted to be exhausted through the lamp exhaust system. The lamp exhaust system shall be positively interconnected with the lamp so that the lamp will not operate unless there is the required airflow. Exhaust air ducts shall terminate at the exterior of the building in such a location that the exhaust air cannot be readily recirculated into any air supply system. The projection room *ventilation* system is permitted to also serve appurtenant rooms, such as the generator and rewind rooms.

409.3.3 Projection machines. Each projection machine shall be provided with an exhaust duct that will draw air from each lamp and exhaust it directly to the outside of the building. The lamp exhaust is permitted to serve to exhaust air from the projection room to provide room air

circulation. Such ducts shall be of rigid materials, except for a flexible connector *approved* for the purpose. The projection lamp or projection room exhaust system, or both, is permitted to be combined but shall not be interconnected with any other exhaust or return system, or both, within the building.

409.4 Lighting control. Provisions shall be made for control of the auditorium lighting and the *means of egress* lighting systems of theaters from inside the projection room and from not less than one other convenient point in the building.

409.5 Miscellaneous equipment. Each projection room shall be provided with rewind and film storage facilities.

SECTION 410 STAGES, PLATFORMS AND TECHNICAL PRODUCTION AREAS

410.1 Applicability. The provisions of Sections 410.1 through 410.8 shall apply to all parts of buildings and structures that contain *stages* or *platforms* and similar appurtenances as herein defined.

410.2 Definitions. The following terms are defined in Chapter 2:

PLATFORM.

PROSCENIUM WALL.

STAGE.

TECHNICAL PRODUCTION AREA.

410.3 Stages. *Stage* construction shall comply with Sections 410.3.1 through 410.3.7.

410.3.1 Stage construction. *Stages* shall be constructed of materials as required for floors for the type of construction of the building in which such *stages* are located.

Exception: *Stages* need not be constructed of the same materials as required for the type of construction provided the construction complies with one of the following:

1. *Stages* of Type IIB or IV construction with a nominal 2-inch (51 mm) wood deck, provided that the *stage* is separated from other areas in accordance with Section 410.3.4.
2. In buildings of Type IIA, IIIA and VA construction, a fire-resistance-rated floor is not required, provided the space below the *stage* is equipped with an *automatic sprinkler system* or *fire-extinguishing system* in accordance with Section 903 or 904.
3. In all types of construction, the finished floor shall be constructed of wood or *approved* non-combustible materials. Openings through *stage* floors shall be equipped with tight-fitting, solid wood trap doors with *approved* safety locks.

410.3.1.1 Stage height and area. *Stage* areas shall be measured to include the entire performance area and adjacent backstage and support areas not separated from the performance area by fire-resistance-rated con-

struction. *Stage* height shall be measured from the lowest point on the *stage* floor to the highest point of the roof or floor deck above the *stage*.

410.3.2 Technical production areas: galleries, gridirons and catwalks. Beams designed only for the attachment of portable or fixed theater equipment, gridirons, galleries and catwalks shall be constructed of *approved* materials consistent with the requirements for the type of construction of the building; and a *fire-resistance rating* shall not be required. These areas shall not be considered to be floors, *stories*, *mezzanines* or levels in applying this code.

Exception: Floors of fly galleries and catwalks shall be constructed of any *approved* material.

410.3.3 Exterior stage doors. Where protection of openings is required, exterior *exit* doors shall be protected with *fire door assemblies* that comply with Section 716. Exterior openings that are located on the *stage* for *means of egress* or loading and unloading purposes, and that are likely to be open during occupancy of the theater, shall be constructed with vestibules to prevent air drafts into the auditorium.

410.3.4 Proscenium wall. Where the *stage* height is greater than 50 feet (15 240 mm), all portions of the *stage* shall be completely separated from the seating area by a proscenium wall with not less than a 2-hour *fire-resistance rating* extending continuously from the foundation to the roof.

410.3.5 Proscenium curtain. Where a proscenium wall is required to have a *fire-resistance rating*, the *stage* opening shall be provided with a fire curtain complying with NFPA 80, horizontal sliding doors complying with Section 716.5.2 having a fire protection rating of at least 1 hour, or an *approved* water curtain complying with Section 903.3.1.1 or, in facilities not utilizing the provisions of smoke-protected assembly seating in accordance with Section 1029.6.2, a smoke control system complying with Section 909 or natural *ventilation* designed to maintain the smoke level not less than 6 feet (1829 mm) above the floor of the *means of egress*.

410.3.6 Scenery. Combustible materials used in sets and scenery shall meet the fire propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701, in accordance with Section 806 and the *Fire Code*. Foam plastics and materials containing foam plastics shall comply with Section 2603 and the *Fire Code*.

410.3.7 Stage ventilation. Emergency *ventilation* shall be provided for *stages* larger than 1,000 square feet (93 m²) in floor area, or with a *stage* height greater than 50 feet (15 240 mm). Such *ventilation* shall comply with Section 410.3.7.1 or 410.3.7.2.

410.3.7.1 Roof vents. Two or more vents constructed to open automatically by *approved* heat-activated devices and with an aggregate clear opening area of not less than 5 percent of the area of the *stage* shall be located near the center and above the highest part of the *stage* area. Supplemental means shall be provided for manual operation of the ventilator. Curbs shall be pro-

vided as required for skylights in Section 2610.2. Vents shall be *labeled*.

410.3.7.2 Smoke control. Smoke control in accordance with Section 909 shall be provided to maintain the smoke layer interface not less than 6 feet (1829 mm) above the highest level of the assembly seating or above the top of the proscenium opening where a proscenium wall is provided in compliance with Section 410.3.4.

410.4 Platform construction. Permanent *platforms* shall be constructed of materials as required for the type of construction of the building in which the permanent *platform* is located. Permanent *platforms* are permitted to be constructed of *fire-retardant-treated wood* for Types I, II and IV construction where the *platforms* are not more than 30 inches (762 mm) above the main floor, and not more than one-third of the room floor area and not more than 3,000 square feet (279 m²) in area. Where the space beneath the permanent *platform* is used for storage or any purpose other than equipment, wiring or plumbing, the floor assembly shall be not less than 1-hour fire-resistance-rated construction. Where the space beneath the permanent *platform* is used only for equipment, wiring or plumbing, the underside of the permanent *platform* need not be protected.

410.4.1 Temporary platforms. *Platforms* installed for a period of not more than 30 days are permitted to be constructed of any materials permitted by this code. The space between the floor and the *platform* above shall only be used for plumbing and electrical wiring to *platform* equipment.

410.5 Dressing and appurtenant rooms. Dressing and appurtenant rooms shall comply with Sections 410.5.1 and 410.5.2.

410.5.1 Separation from stage. The *stage* shall be separated from dressing rooms, scene docks, property rooms, workshops, storerooms and compartments appurtenant to the *stage* and other parts of the building by *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The *fire-resistance rating* shall be not less than 2 hours for *stage* heights greater than 50 feet (15 240 mm) and not less than 1 hour for *stage* heights of 50 feet (15 240 mm) or less.

410.5.2 Separation from each other. Dressing rooms, scene docks, property rooms, workshops, storerooms and compartments appurtenant to the *stage* shall be separated from each other by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

410.6 Means of egress. Except as modified or as provided for in this section, the provisions of Chapter 10 shall apply.

410.6.1 Arrangement. Where two or more *exits* or *exit access doorways* from the *stage* are required in accordance with Section 1006.2, no fewer than one *exit* or *exit access doorway* shall be provided on each side of a *stage*.

410.6.2 Stairway and ramp enclosure. *Exit access stairways* and *ramps* serving a *stage* or *platform* are not required to be enclosed. *Exit access stairways* and *ramps* serving *technical production areas* are not required to be enclosed.

410.6.3 Technical production areas. *Technical production areas* shall be provided with means of egress and means of escape in accordance with Sections 410.6.3.1 through 410.6.3.5.

410.6.3.1 Number of means of egress. No fewer than one *means of egress* shall be provided from *technical production areas*.

410.6.3.2 Exit access travel distance. The *exit access* travel distance shall be not greater than 300 feet (91 440 mm) for buildings without a sprinkler system and 400 feet (121 900 mm) for buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

410.6.3.3 Two means of egress. Where two *means of egress* are required, the *common path of travel* shall be not greater than 100 feet (30 480 mm).

Exception: A means of escape to a roof in place of a second *means of egress* is permitted.

410.6.3.4 Path of egress travel. The following *exit access* components are permitted where serving *technical production areas*:

1. *Stairways*.
2. *Ramps*.
3. *Spiral stairways*.
4. *Catwalks*.
5. *Alternating tread devices*.
6. Permanent ladders.

410.6.3.5 Width. The path of egress travel within and from technical support areas shall be not less than 22 inches (559 mm).

410.7 Automatic sprinkler system. *Stages* shall be equipped with an *automatic sprinkler system* in accordance with Section 903.3.1.1. Sprinklers shall be installed under the roof and gridiron and under all catwalks and galleries over the *stage*. Sprinklers shall be installed in dressing rooms, performer lounges, shops and storerooms accessory to such *stages*.

Exceptions:

1. Sprinklers are not required under *stage* areas less than 4 feet (1219 mm) in clear height that are utilized exclusively for storage of tables and chairs, provided the concealed space is separated from the adjacent spaces by Type X gypsum board not less than ⁵/₈-inch (15.9 mm) in thickness.
2. Sprinklers are not required for *stages* 1,000 square feet (93 m²) or less in area and 50 feet (15 240 mm) or less in height where curtains, scenery or other combustible hangings are not retractable vertically. Combustible hangings shall be limited to a single main curtain, borders, legs and a single backdrop.

3. Sprinklers are not required within portable orchestra enclosures on *stages*.

410.8 Standpipes. Standpipe systems shall be provided in accordance with Section 905.

SECTION 411 SPECIAL AMUSEMENT BUILDINGS

411.1 General. *Special amusement buildings* having an *occupant load* of 50 or more shall comply with the requirements for the appropriate Group A occupancy and Sections 411.1 through 411.8. *Special amusement buildings* having an *occupant load* of less than 50 shall comply with the requirements for a Group B occupancy and Sections 411.1 through 411.8.

Exception: *Special amusement buildings* or portions thereof that are without walls or a roof and constructed to prevent the accumulation of smoke need not comply with this section.

For flammable *decorative materials*, see the *Fire Code*.

411.2 Definition. The following term is defined in Chapter 2:

SPECIAL AMUSEMENT BUILDING.

411.3 Automatic fire detection. *Special amusement buildings* shall be equipped with an automatic fire detection system in accordance with Section 907.

411.4 Automatic sprinkler system. *Special amusement buildings* shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1. Where the *special amusement building* is temporary, the sprinkler water supply shall be of an *approved* temporary means.

Exception: Automatic sprinklers are not required where the total floor area of a temporary *special amusement building* is less than 1,000 square feet (93 m²) and the exit access travel distance from any point to an exit is less than 50 feet (15 240 mm).

411.5 Alarm. Actuation of a single *smoke detector*, the *automatic sprinkler system* or other automatic fire detection device shall immediately sound an alarm at the building at a *constantly attended location* from which emergency action can be initiated including the capability of manual initiation of requirements in Section 907.2.12.2.

411.6 Emergency voice/alarm communications system. An *emergency voice/alarm communications system* shall be provided in accordance with Sections 907.2.12 and 907.5.2.2, which is also permitted to serve as a public address system and shall be audible throughout the entire *special amusement building*.

411.7 Exit marking. Exit signs shall be installed at the required *exit* or *exit access doorways* of amusement buildings in accordance with this section and Section 1013. *Approved* directional exit markings shall also be provided. Where mirrors, mazes or other designs are utilized that disguise the path of egress travel such that they are not apparent, *approved* and

listed low-level exit signs that comply with Section 1013.5, and directional path markings *listed* in accordance with UL 1994, shall be provided and located not more than 8 inches (203 mm) above the walking surface and on or near the path of egress travel. Such markings shall become visible in an emergency. The directional exit marking shall be activated by the automatic fire detection system and the *automatic sprinkler system* in accordance with Section 907.2.12.2.

411.7.1 Photoluminescent exit signs. Where *photoluminescent exit* signs are installed, activating light source and viewing distance shall be in accordance with the listing and markings of the signs.

411.8 Interior finish. The *interior finish* shall be Class A in accordance with Section 803.1.

SECTION 412 AIRCRAFT-RELATED OCCUPANCIES

412.1 General. Aircraft-related occupancies shall comply with Sections 412.1 through 412.8 and the *Fire Code*.

412.2 Definitions. The following terms are defined in Chapter 2:

FIXED BASE OPERATOR (FBO).

HELIPORT.

HELISTOP.

RESIDENTIAL AIRCRAFT HANGAR.

TRANSIENT AIRCRAFT.

412.3 Airport traffic control towers. The provisions of Sections 412.3.1 through 412.3.8 shall apply to airport traffic control towers occupied only for the following uses:

1. Airport traffic control cab.
2. Electrical and mechanical equipment rooms.
3. Airport terminal radar and electronics rooms.
4. Office spaces incidental to the tower operation.
5. Lounges for employees, including sanitary facilities.

412.3.1 Type of construction. Airport traffic control towers shall be constructed to comply with the height limitations of Table 412.3.1.

**TABLE 412.3.1
HEIGHT LIMITATIONS FOR
AIRPORT TRAFFIC CONTROL TOWERS**

| TYPE OF CONSTRUCTION | HEIGHT ^a (feet) |
|----------------------|-------------------------------|
| IA | Unlimited |
| IB | 240 |
| IIA | 100 |
| IIB | 85 |
| IIIA | 65 |

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m².

a. Height to be measured from grade plane to cab floor.

412.3.2 Stairways. Stairways in airport traffic control towers shall be in accordance with Section 1011. Stairways shall be smokeproof enclosures complying with one of the alternatives provided in Section 909.20.

Exception: Stairways in airport traffic control towers are not required to comply with Section 1011.12.

412.3.3 Exit access. From observation levels, airport traffic control towers shall be permitted to have a single means of exit access for a distance of travel not greater than 100 feet (30 480 mm). Exit access stairways from the observation level need not be enclosed.

412.3.4 Number of exits. Not less than one *exit stairway* shall be permitted for airport traffic control towers of any height provided that the *occupant load* per floor is not greater than 15 and the area per floor does not exceed 1,500 square feet (140 m²).

412.3.4.1 Interior finish. Where an airport traffic control tower is provided with only one exit stairway, interior wall and ceiling finishes shall be either Class A or Class B.

412.3.5 Automatic fire detection systems. Airport traffic control towers shall be provided with an automatic fire detection system installed in accordance with Section 907.2.

412.3.6 Automatic sprinkler system. Where an occupied floor is located more than 35 feet (10 668 mm) above the lowest level of fire department vehicle access, airport traffic control towers shall be equipped with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

412.3.7 Elevator protection. Wires or cables that provide normal or standby power, control signals, communication with the car, lighting, heating, air conditioning, *ventilation* and fire detecting systems to elevators shall be protected by construction having a *fire-resistance rating* of not less than 1 hour, or shall be circuit integrity cable having a fire-resistance rating of not less than 1 hour.

412.3.7.1 Elevators for occupant evacuation. Where provided in addition to an exit stairway, occupant evacuation elevators shall be in accordance with Section 3008.

412.3.8 Accessibility. Airport traffic control towers need not be *accessible* as specified in the provisions of Chapter 11.

412.4 Aircraft hangars. Aircraft hangars shall be in accordance with Sections 412.4.1 through 412.4.6.

412.4.1 Exterior walls. *Exterior walls* located less than 30 feet (9144 mm) from *lot lines* or a *public way* shall have a *fire-resistance rating* not less than 2 hours.

412.4.2 Basements. Where hangars have *basements*, floors over *basements* shall be of Type IA construction and shall be made tight against seepage of water, oil or vapors. There shall be no opening or communication between *basements* and the hangar. Access to *basements* shall be from outside only.

412.4.3 Floor surface. Floors shall be graded and drained to prevent water or fuel from remaining on the floor. Floor

drains shall discharge through an oil separator to the sewer or to an outside vented sump.

Exception: Aircraft hangars with individual lease spaces not exceeding 2,000 square feet (186 m²) each in which servicing, repairing or washing is not conducted and fuel is not dispensed shall have floors that are graded toward the door, but shall not require a separator.

412.4.4 Heating equipment. Heating equipment shall be placed in another room separated by 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. Entrance shall be from the outside or by means of a vestibule providing a two-doorway separation.

Exceptions:

1. Unit heaters and vented infrared radiant heating equipment suspended not less than 10 feet (3048 mm) above the upper surface of wings or engine enclosures of the highest aircraft that are permitted to be housed in the hangar need not be located in a separate room provided they are mounted not less than 8 feet (2438 mm) above the floor in shops, offices and other sections of the hangar communicating with storage or service areas.
2. Entrance to the separated room shall be permitted by a single interior door provided the sources of ignition in the appliances are not less than 18 inches (457 mm) above the floor.

412.4.5 Finishing. The process of “doping,” involving use of a volatile flammable solvent, or of painting, shall be carried on in a separate *detached building* equipped with *automatic fire-extinguishing equipment* in accordance with Section 903.

412.4.6 Fire suppression. Aircraft hangars shall be provided with a fire suppression system designed in accordance with NFPA 409, based upon the classification for the hangar given in Table 412.4.6.

Exception: Where a *fixed base operator* has separate repair facilities on site, Group II hangars operated by a *fixed base operator* used for storage of *transient aircraft* only shall have a fire suppression system, but the system is exempt from foam requirements.

412.4.6.1 Hazardous operations. Any Group III aircraft hangar according to Table 412.4.6 that contains hazardous operations including, but not limited to, the following shall be provided with a Group I or II fire suppression system in accordance with NFPA 409 as applicable:

1. Doping.
2. Hot work including, but not limited to, welding, torch cutting and torch soldering.
3. Fuel transfer.
4. Fuel tank repair or maintenance not including defueled tanks in accordance with NFPA 409, inerted tanks or tanks that have never been fueled.

TABLE 412.4.6
HANGAR FIRE SUPPRESSION REQUIREMENTS^{a,b,c}

| MAXIMUM SINGLE FIRE AREA (square feet) | TYPE OF CONSTRUCTION | | | | | | | | |
|--|----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | IA | IB | IIA | IIB | IIIA | IIIB | IV | VA | VB |
| ≥ 40,001 | Group I | Group I | Group I | Group I | Group I | Group I | Group I | Group I | Group I |
| 40,000 | Group II | Group II | Group II | Group II | Group II | Group II | Group II | Group II | Group II |
| 30,000 | Group III | Group II | Group II | Group II | Group II | Group II | Group II | Group II | Group II |
| 20,000 | Group III | Group III | Group II | Group II | Group II | Group II | Group II | Group II | Group II |
| 15,000 | Group III | Group III | Group III | Group II | Group III | Group II | Group III | Group II | Group II |
| 12,000 | Group III | Group III | Group III | Group III | Group III | Group III | Group III | Group II | Group II |
| 8,000 | Group III | Group III | Group III | Group III | Group III | Group III | Group III | Group III | Group II |
| 5,000 | Group III | Group III | Group III | Group III | Group III | Group III | Group III | Group III | Group III |

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m².

a. Aircraft hangars with a door height greater than 28 feet shall be provided with fire suppression for a Group I hangar regardless of maximum fire area.

b. Groups shall be as classified in accordance with NFPA 409.

c. Membrane structures complying with Section 3102 shall be classified as a Group IV hangar.

5. Spray finishing operations.
6. Total fuel capacity of all aircraft within the unsprinklered single *fire area* in excess of 1,600 gallons (6057 L).
7. Total fuel capacity of all aircraft within the maximum single *fire area* in excess of 7,500 gallons (28 390 L) for a hangar with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

412.4.6.2 Separation of maximum single fire areas.

Maximum single *fire areas* established in accordance with hangar classification and construction type in Table 412.4.6 shall be separated by 2-hour *fire walls* constructed in accordance with Section 706. In determining the maximum single *fire area* as set forth in Table 412.4.6, ancillary uses that are separated from aircraft servicing areas by a *fire barrier* of not less than 1 hour, constructed in accordance with Section 707, shall not be included in the area.

412.5 Residential aircraft hangars. Residential aircraft hangars shall comply with Sections 412.5.1 through 412.5.5.

412.5.1 Fire separation. A hangar shall not be attached to a *dwelling* unless separated by a *fire barrier* having a *fire-resistance rating* of not less than 1 hour. Such separation shall be continuous from the foundation to the underside of the roof and unpierced except for doors leading to the *dwelling unit*. Doors into the *dwelling unit* shall be equipped with *self-closing* devices and conform to the requirements of Section 716 with a noncombustible raised sill not less than 4 inches (102 mm) in height. Openings from a hangar directly into a room used for sleeping purposes shall not be permitted.

412.5.2 Egress. A hangar shall provide two *means of egress*. One of the doors into the *dwelling* shall be considered as meeting only one of the two *means of egress*.

412.5.3 Smoke alarms. *Smoke alarms* shall be provided within the hangar in accordance with Section 907.2.21.

412.5.4 Independent systems. Electrical, mechanical and plumbing drain, waste and vent (DWV) systems installed within the hangar shall be independent of the systems installed within the dwelling. Building sewer lines shall be permitted to be connected outside the structures.

Exception: *Smoke detector* wiring and feed for electrical subpanels in the hangar.

412.5.5 Height and area limits. *Residential aircraft hangars* shall be not greater than 2,000 square feet (186 m²) in area and 20 feet (6096 mm) in *building height*.

412.6 Aircraft paint hangars. Aircraft painting operations where flammable liquids are used in excess of the maximum allowable quantities per *control area* listed in Table 307.1(1) shall be conducted in an aircraft paint hangar that complies with the provisions of Sections 412.6.1 through 412.6.6.

412.6.1 Occupancy group. Aircraft paint hangars shall be classified as Group H-2. Aircraft paint hangars shall comply with the applicable requirements of this code and the *Fire Code* for such occupancy.

412.6.2 Construction. The aircraft paint hangar shall be of Type I or II construction.

412.6.3 Operations. Only those flammable liquids necessary for painting operations shall be permitted in quantities less than the maximum allowable quantities per *control area* in Table 307.1(1). Spray equipment cleaning operations shall be conducted in a liquid use, dispensing and mixing room.

412.6.4 Storage. Storage of flammable liquids shall be in a liquid storage room.

412.6.5 Fire suppression. Aircraft paint hangars shall be provided with fire suppression as required by NFPA 409.

412.6.6 Ventilation. Aircraft paint hangars shall be provided with *ventilation* as required in the *Mechanical Code*.

412.7 Aircraft manufacturing facilities. In buildings used for the manufacturing of aircraft, exit access travel distances indicated in Section 1017.1 shall be increased in accordance with the following:

1. The building shall be of Type I or II construction.
2. Exit access travel distance shall not exceed the distances given in Table 412.7.

412.7.1 Ancillary areas. Rooms, areas and spaces ancillary to the primary manufacturing area shall be permitted to egress through such area having a minimum height as indicated in Table 412.7. Exit access travel distance within the ancillary room, area or space shall not exceed that indicated in Table 1017.2 based on the occupancy classification of that ancillary area. Total exit access travel distance shall not exceed that indicated in Table 412.7.

412.8 Heliports and helistops. *Heliports* and *helistops* shall be permitted to be erected on buildings or other locations where they are constructed in accordance with Sections 412.8.1 through 412.8.5.

412.8.1 Size. The landing area for helicopters less than 3,500 pounds (1588 kg) shall be not less than 20 feet (6096 mm) in length and width. The landing area shall be surrounded on all sides by a clear area having a minimum average width at roof level of 15 feet (4572 mm) but with no width less than 5 feet (1524 mm).

412.8.2 Design. Helicopter landing areas and the supports thereof on the roof of a building shall be noncombustible construction. Landing areas shall be designed to confine any flammable liquid spillage to the landing area itself and provisions shall be made to drain such spillage away from any *exit* or *stairway* serving the helicopter landing area or from a structure housing such *exit* or *stairway*. For structural design requirements, see Section 1607.6.

412.8.3 Means of egress. The *means of egress* from *heliports* and *helistops* shall comply with the provisions of Chapter 10. Landing areas located on buildings or structures shall have two or more *means of egress*. For landing areas less than 60 feet (18 288 mm) in length or less than 2,000 square feet (186 m²) in area, the second *means of egress* is permitted to be a fire escape, *alternating tread device* or ladder leading to the floor below.

412.8.4 Rooftop heliports and helistops. Rooftop *heliports* and *helistops* shall comply with NFPA 418.

412.8.5 Standpipe system. In buildings equipped with a standpipe system, the standpipe shall extend to the roof level in accordance with Section 905.3.6.

SECTION 413 COMBUSTIBLE STORAGE

413.1 General. High-piled stock or rack storage in any occupancy group shall comply with the *Fire Code*.

413.2 Attic, under-floor and concealed spaces. *Attic*, under-floor and concealed spaces used for storage of combustible materials shall be protected on the storage side as required for 1-hour fire-resistance-rated construction. Openings shall be protected by assemblies that are *self-closing* and are of noncombustible construction or solid wood core not less than 1³/₄ inch (45 mm) in thickness.

Exception: Neither fire-resistance-rated construction nor opening protectives are required in any of the following locations:

1. Areas protected by *approved automatic sprinkler systems*.
2. Group R-3 and U occupancies.

SECTION 414 HAZARDOUS MATERIALS

414.1 General. The provisions of Sections 414.1 through 414.6 shall apply to buildings and structures occupied for the manufacturing, processing, dispensing, use or storage of hazardous materials.

414.1.1 Other provisions. Buildings and structures with an occupancy in Group H shall comply with this section and the applicable provisions of Section 415 and the *Fire Code*.

414.1.2 Materials. The safe design of hazardous material occupancies is material dependent. Individual material requirements are also found in Sections 307 and 415, and in the *Mechanical Code* and the *Fire Code*.

414.1.2.1 Aerosols. Level 2 and 3 aerosol products shall be stored and displayed in accordance with the

TABLE 412.7
AIRCRAFT MANUFACTURING EXIT ACCESS TRAVEL DISTANCE

| HEIGHT (feet) ^b | MANUFACTURING AREA (sq. ft.) ^a | | | | | |
|----------------------------|---|-----------|-----------|-----------|-----------|-------------|
| | ≥ 150,000 | ≥ 200,000 | ≥ 250,000 | ≥ 500,000 | ≥ 750,000 | ≥ 1,000,000 |
| ≥ 25 | 400 | 450 | 500 | 500 | 500 | 500 |
| ≥ 50 | 400 | 500 | 600 | 700 | 700 | 700 |
| ≥ 75 | 400 | 500 | 700 | 850 | 1,000 | 1,000 |
| ≥ 100 | 400 | 500 | 750 | 1,000 | 1,250 | 1,500 |

For SI: 1 foot = 304.8 mm.

a. Contiguous floor area of the aircraft manufacturing facility having the indicated height.

b. Minimum height from finished floor to bottom of ceiling or roof slab or deck.

SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY

Fire Code. See Section 311.2 and the *Fire Code* for occupancy group requirements.

414.1.3 Information required. A report shall be submitted to the *building official* identifying the maximum expected quantities of hazardous materials to be stored, used in a *closed system* and used in an *open system*, and subdivided to separately address hazardous material classification categories based on Tables 307.1(1) and 307.1(2). The methods of protection from such hazards, including but not limited to *control areas*, fire protection systems and Group H occupancies shall be indicated in the report and on the *construction documents*. The opinion and report shall be prepared by a qualified person, firm or corporation *approved* by the *building official* and provided without charge to the enforcing agency.

For buildings and structures with an occupancy in Group H, separate floor plans shall be submitted identifying the locations of anticipated contents and processes so as to reflect the nature of each occupied portion of every building and structure.

414.2 Control areas. *Control areas* shall comply with Sections 414.2.1 through 414.2.5 and the *Fire Code*.

414.2.1 Construction requirements. *Control areas* shall be separated from each other by *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

414.2.2 Percentage of maximum allowable quantities. The percentage of maximum allowable quantities of hazardous materials per *control area* permitted at each floor level within a building shall be in accordance with Table 414.2.2.

414.2.3 Number. The maximum number of *control areas* within a building shall be in accordance with Table 414.2.2.

414.2.4 Fire-resistance-rating requirements. The required *fire-resistance rating* for *fire barriers* shall be in accordance with Table 414.2.2. The floor assembly of the *control area* and the construction supporting the floor of

the *control area* shall have a *fire-resistance rating* of not less than 2 hours.

Exception: The floor assembly of the *control area* and the construction supporting the floor of the *control area* are allowed to be 1-hour fire-resistance rated in buildings of Types IIA, IIIA and VA construction, provided that both of the following conditions exist:

1. The building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1; and
2. The building is three or fewer *stories above grade plane*.

414.2.5 Hazardous material in Group M display and storage areas and in Group S storage areas. The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials permitted within a single *control area* of a Group M display and storage area, a Group S storage area or an outdoor *control area* is permitted to exceed the maximum allowable quantities per *control area* specified in Tables 307.1(1) and 307.1(2) without classifying the building or use as a Group H occupancy, provided that the materials are displayed and stored in accordance with the *Fire Code* and quantities do not exceed the maximum allowable specified in Table 414.2.5(1).

In Group M occupancy wholesale and retail sales uses, indoor storage of flammable and combustible liquids shall not exceed the maximum allowable quantities per *control area* as indicated in Table 414.2.5(2), provided that the materials are displayed and stored in accordance with the *Fire Code*.

The maximum quantity of aerosol products in Group M occupancy retail display areas, storage areas adjacent to retail display areas and retail storage areas shall be in accordance with the *Fire Code*.

414.3 Ventilation. Rooms, areas or spaces in which explosive, corrosive, combustible, flammable or highly toxic dusts, mists, fumes, vapors or gases are or may be emitted due to the processing, use, handling or storage of materials shall be

TABLE 414.2.2
DESIGN AND NUMBER OF CONTROL AREAS

| FLOOR LEVEL | | PERCENTAGE OF THE MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA ^a | NUMBER OF CONTROL AREAS PER FLOOR | FIRE-RESISTANCE RATING FOR FIRE BARRIERS IN HOURS ^b |
|-------------------|---------------|--|-----------------------------------|--|
| Above grade plane | Higher than 9 | 5 | 1 | 2 |
| | 7-9 | 5 | 2 | 2 |
| | 6 | 12.5 | 2 | 2 |
| | 5 | 12.5 | 2 | 2 |
| | 4 | 12.5 | 2 | 2 |
| | 3 | 50 | 2 | 1 |
| | 2 | 75 | 3 | 1 |
| | 1 | 100 | 4 | 1 |
| Below grade plane | 1 | 75 | 3 | 1 |
| | 2 | 50 | 2 | 1 |
| | Lower than 2 | Not Allowed | Not Allowed | Not Allowed |

a. Percentages shall be of the maximum allowable quantity per control area shown in Tables 307.1(1) and 307.1(2), with all increases allowed in the notes to those tables.

b. Separation shall include fire barriers and horizontal assemblies as necessary to provide separation from other portions of the building.

mechanically ventilated where required by this code, the *Fire Code* or the *Mechanical Code*.

Emissions generated at workstations shall be confined to the area in which they are generated as specified in the *Fire Code* and the *Mechanical Code*.

414.4 Hazardous material systems. Systems involving hazardous materials shall be suitable for the intended application. Controls shall be designed to prevent materials from entering or leaving process or reaction systems at other than the intended time, rate or path. Automatic controls, where provided, shall be designed to be fail safe.

414.5 Inside storage, dispensing and use. The inside storage, dispensing and use of hazardous materials shall be in accordance with Sections 414.5.1 through 414.5.3 of this code and the *Fire Code*.

414.5.1 Explosion control. Explosion control shall be provided in accordance with the *Fire Code* as required by Table 414.5.1 where quantities of hazardous materials specified in that table exceed the maximum allowable quantities in Table 307.1(1) or where a structure, room or space is occupied for purposes involving explosion hazards as required by Section 415 or the *Fire Code*.

414.5.2 Emergency or standby power. Where required by the *Fire Code* or this code, mechanical ventilation, treatment systems, temperature control, alarm, detection or other electrically operated systems shall be provided with emergency or standby power in accordance with Section 2702. For storage and use areas for highly toxic or toxic materials, see Sections 6004.2.2.8 and 6004.3.4.2 of the *Fire Code*.

TABLE 414.2.5(1)
MAXIMUM ALLOWABLE QUANTITY PER INDOOR AND OUTDOOR CONTROL AREA IN GROUP M AND S OCCUPANCIES
NONFLAMMABLE SOLIDS AND NONFLAMMABLE AND NONCOMBUSTIBLE LIQUIDS^{d,e,f}

| CONDITION | | MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA | |
|--|------------------|---|----------------------|
| Material ^a | Class | Solids pounds | Liquids gallons |
| A. Health-hazard materials—nonflammable and noncombustible solids and liquids | | | |
| 1. Corrosives ^{b,c} | Not Applicable | 9,750 | 975 |
| 2. Highly toxics | Not Applicable | 20 ^{b,c} | 2 ^{b,c} |
| 3. Toxics ^{b,c} | Not Applicable | 1,000 | 100 |
| B. Physical-hazard materials—nonflammable and noncombustible solids and liquids | | | |
| 1. Oxidizers ^{b,c} | 4 | Not Allowed | Not Allowed |
| | 3 | 1,150 ^e | 115 |
| | 2 | 2,250 ^h | 225 |
| | 1 | 18,000 ^{i,j} | 1,800 ^{i,j} |
| 2. Unstable (reactives) ^{b,c} | 4 | Not Allowed | Not Allowed |
| | 3 | 550 | 55 |
| | 2 | 1,150 | 115 |
| | 1 | Not Limited | Not Limited |
| 3. Water reactives | 3 ^{b,c} | 550 | 55 |
| | 2 ^{b,c} | 1,150 | 115 |
| | 1 | Not Limited | Not Limited |

For SI: 1 pound = 0.454 kg, 1 gallon = 3.785 L.

a. Hazard categories are as specified in the *Fire Code*.

b. Maximum allowable quantities shall be increased 100 percent in buildings that are sprinklered in accordance with Section 903.3.1.1. When Note c also applies, the increase for both notes shall be applied cumulatively.

c. Maximum allowable quantities shall be increased 100 percent when stored in approved storage cabinets, in accordance with the *Fire Code*. When Note b also applies, the increase for both notes shall be applied cumulatively.

d. See Table 414.2.2 for design and number of control areas.

e. Allowable quantities for other hazardous material categories shall be in accordance with Section 307.

f. Maximum quantities shall be increased 100 percent in outdoor control areas.

g. Maximum amounts shall be increased to 2,250 pounds when individual packages are in the original sealed containers from the manufacturer or packager and do not exceed 10 pounds each.

h. Maximum amounts shall be increased to 4,500 pounds when individual packages are in the original sealed containers from the manufacturer or packager and do not exceed 10 pounds each.

i. The permitted quantities shall not be limited in a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

j. Quantities are unlimited in an outdoor control area.

TABLE 414.2.5(2)
MAXIMUM ALLOWABLE QUANTITY OF FLAMMABLE AND
COMBUSTIBLE LIQUIDS IN WHOLESALE AND RETAIL SALES OCCUPANCIES PER CONTROL AREA^a

| TYPE OF LIQUID | MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA (gallons) | | |
|---------------------------|--|--|----------------|
| | Sprinklered in accordance with note b densities and arrangements | Sprinklered in accordance with Tables 5704.3.6.3(4) through 5704.3.6.3(8) and 5704.3.7.5.1 of the <i>Fire Code</i> | Nonsprinklered |
| Class IA | 60 | 60 | 30 |
| Class IB, IC, II and IIIA | 7,500 ^c | 15,000 ^c | 1,600 |
| Class IIIB | Unlimited | Unlimited | 13,200 |

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 gallon = 3.785 L, 1 gallon per minute per square foot = 40.75 L/min/m².

- a. Control areas shall be separated from each other by not less than a 1-hour fire barrier wall.
- b. To be considered as sprinklered, a building shall be equipped throughout with an approved automatic sprinkler system with a design providing minimum densities as follows:
1. For uncartoned commodities on shelves 6 feet or less in height where the ceiling height does not exceed 18 feet, quantities are those permitted with a minimum sprinkler design density of Ordinary Hazard Group 2.
 2. For cartoned, palletized or racked commodities where storage is 4 feet 6 inches or less in height and where the ceiling height does not exceed 18 feet, quantities are those permitted with a minimum sprinkler design density of 0.21 gallon per minute per square foot over the most remote 1,500-square-foot area.
- c. Where wholesale and retail sales or storage areas exceed 50,000 square feet in area, the maximum allowable quantities are allowed to be increased by 2 percent for each 1,000 square feet of area in excess of 50,000 square feet, up to a maximum of 100 percent of the table amounts. A control area separation is not required. The cumulative amounts, including amounts attained by having an additional control area, shall not exceed 30,000 gallons.

414.5.2.1 Exempt applications. Emergency or standby power is not required for the mechanical ventilation systems provided for any of the following:

1. Storage of Class IB and IC flammable and combustible liquids in closed containers not exceeding 6.5 gallons (25 L) capacity.
2. Storage of Class 1 and 2 oxidizers.
3. Storage of Class II, III, IV and V organic peroxides.
4. Storage of asphyxiant, irritant and radioactive gases.

414.5.2.2 Fail-safe engineered systems. Standby power for mechanical ventilation, treatment systems and temperature control systems shall not be required where an approved fail-safe engineered system is installed.

414.5.3 Spill control, drainage and containment. Rooms, buildings or areas occupied for the storage of solid and liquid hazardous materials shall be provided with a means to control spillage and to contain or drain off spillage and fire protection water discharged in the storage area where required in the *Fire Code*. The methods of spill control shall be in accordance with the *Fire Code*.

414.6 Outdoor storage, dispensing and use. The outdoor storage, dispensing and use of hazardous materials shall be in accordance with the *Fire Code*.

414.6.1 Weather protection. Where weather protection is provided for sheltering outdoor hazardous material storage or use areas, such areas shall be considered outdoor storage or use when the weather protection structure complies with Sections 414.6.1.1 through 414.6.1.3.

414.6.1.1 Walls. Walls shall not obstruct more than one side of the structure.

Exception: Walls shall be permitted to obstruct portions of multiple sides of the structure, provided that

the obstructed area is not greater than 25 percent of the structure's perimeter.

414.6.1.2 Separation distance. The distance from the structure to buildings, *lot lines*, *public ways* or *means of egress* to a *public way* shall be not less than the distance required for an outside hazardous material storage or use area without weather protection.

414.6.1.3 Noncombustible construction. The overhead structure shall be of *approved* noncombustible construction with a maximum area of 1,500 square feet (140 m²).

Exception: The maximum area is permitted to be increased as provided by Section 506.

SECTION 415

GROUPS H-1, H-2, H-3, H-4 AND H-5

415.1 Scope. The provisions of Sections 415.1 through 415.11 shall apply to the storage and use of hazardous materials in excess of the maximum allowable quantities per *control area* listed in Section 307.1. Buildings and structures with an occupancy in Group H shall also comply with the applicable provisions of Section 414 and the *Fire Code*.

415.2 Definitions. The following terms are defined in Chapter 2:

CONTINUOUS GAS DETECTION SYSTEM.

DETACHED BUILDING.

EMERGENCY CONTROL STATION.

EXHAUSTED ENCLOSURE.

FABRICATION AREA.

FLAMMABLE VAPORS OR FUMES.

GAS CABINET.

GASROOM.

HAZARDOUS PRODUCTION MATERIAL (HPM).

HPM FLAMMABLE LIQUID.

HPM ROOM.

IMMEDIATELY DANGEROUS TO LIFE AND
HEALTH (IDLH).

LIQUID.

LIQUID STORAGE ROOM.

LIQUID USE, DISPENSING AND MIXING ROOM.

LOWER FLAMMABLE LIMIT (LFL).

NORMAL TEMPERATURE AND PRESSURE (NTP).

PHYSIOLOGICAL WARNING THRESHOLD LEVEL.

SERVICE CORRIDOR.

SOLID.

STORAGE, HAZARDOUS MATERIALS.

USE (MATERIAL).

WORKSTATION.

415.3 Automatic fire detection systems. Group H occupancies shall be provided with an automatic fire detection system in accordance with Section 907.2.**415.4 Automatic sprinkler system.** Group H occupancies shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.2.5.**TABLE 414.5.1**
EXPLOSION CONTROL REQUIREMENTS^{a, h}

| MATERIAL | CLASS | EXPLOSION CONTROL METHODS | |
|---|----------------------------|---------------------------|--|
| | | Barricade construction | Explosion (deflagration) venting or explosion (deflagration) prevention systems ^b |
| HAZARD CATEGORY | | | |
| Combustible dusts ^c | — | Not Required | Required |
| Cryogenic flammables | — | Not Required | Required |
| Explosives | Division 1.1 | Required | Not Required |
| | Division 1.2 | Required | Not Required |
| | Division 1.3 | Not Required | Required |
| | Division 1.4 | Not Required | Required |
| | Division 1.5 | Required | Not Required |
| | Division 1.6 | Required | Not Required |
| Flammable gas | Gaseous | Not Required | Required |
| | Liquefied | Not Required | Required |
| Flammable liquid | IA ^d | Not Required | Required |
| | IB ^e | Not Required | Required |
| Organic peroxides | U | Required | Not Permitted |
| | I | Required | Not Permitted |
| Oxidizer liquids and solids | 4 | Required | Not Permitted |
| Pyrophoric gas | — | Not Required | Required |
| Unstable (reactive) | 4 | Required | Not Permitted |
| | 3 Detonable | Required | Not Permitted |
| | 3 Nondetonable | Not Required | Required |
| Water-reactive liquids and solids | 3 | Not Required | Required |
| | 2 ^g | Not Required | Required |
| SPECIAL USES | | | |
| Acetylene generator rooms | — | Not Required | Required |
| Grain processing | — | Not Required | Required |
| Liquefied petroleum gas-distribution facilities | — | Not Required | Required |
| Where explosion hazards exist ^f | Detonation Deflagration | Required Not Required | Not Permitted Required |

a. See [Section 414.1.3](#).b. See the *Fire Code*.

c. As generated during manufacturing or processing.

d. Storage or use.

e. In open use or dispensing.

f. Rooms containing dispensing and use of hazardous materials when an explosive environment can occur because of the characteristics or nature of the hazardous materials or as a result of the dispensing or use process.

g. A method of explosion control shall be provided when Class 2 water-reactive materials can form potentially explosive mixtures.

h. Explosion venting is not required for Group H-5 fabrication areas complying with Section 415.11.1 and the *Fire Code*.

415.5 Emergency alarms. Emergency alarms for the detection and notification of an emergency condition in Group H occupancies shall be provided as set forth herein.

415.5.1 Storage. An approved manual emergency alarm system shall be provided in buildings, rooms or areas used for storage of hazardous materials. Emergency alarm-initiating devices shall be installed outside of each interior exit or exit access door of storage buildings, rooms or areas. Activation of an emergency alarm-initiating device shall sound a local alarm to alert occupants of an emergency situation involving hazardous materials.

415.5.2 Dispensing, use and handling. Where hazardous materials having a hazard ranking of 3 or 4 in accordance with NFPA 704 are transported through corridors, interior exit stairways or ramps, or exit passageways, there shall be an emergency telephone system, a local manual alarm station or an approved alarm-initiating device at not more than 150-foot (45 720 mm) intervals and at each exit and exit access doorway throughout the transport route. The signal shall be relayed to an approved central, proprietary or remote station service or constantly attended on-site location and shall initiate a local audible alarm.

415.5.3 Supervision. Emergency alarm systems shall be supervised by an approved central, proprietary or remote station service or shall initiate an audible and visual signal at a constantly attended on-site location.

415.5.4 Emergency alarm systems. *Emergency alarm systems* shall be provided with emergency power in accordance with Section 2702.

415.6 Fire separation distance. Group H occupancies shall be located on property in accordance with the other provisions of this chapter. In Groups H-2 and H-3, not less than 25 percent of the perimeter wall of the occupancy shall be an *exterior wall*.

Exceptions:

1. *Liquid use, dispensing and mixing rooms* having a floor area of not more than 500 square feet (46.5 m²) need not be located on the outer perimeter of the building where they are in accordance with the *Fire Code* and NFPA 30.
2. *Liquid storage rooms* having a floor area of not more than 1,000 square feet (93 m²) need not be located on the outer perimeter where they are in accordance with the *Fire Code* and NFPA 30.
3. Spray paint booths that comply with the *Fire Code* need not be located on the outer perimeter.

415.6.1 Group H occupancy minimum fire separation distance. Regardless of any other provisions, buildings containing Group H occupancies shall be set back to the minimum *fire separation distance* as set forth in Sections 415.6.1.1 through 415.6.1.4. Distances shall be measured from the walls enclosing the occupancy to *lot lines*, including those on a public way. Distances to assumed *lot lines* established for the purpose of determining exterior wall and opening protection are not to be used to establish the minimum *fire separation distance* for buildings on sites where explosives are manufactured or used when

separation is provided in accordance with the quantity distance tables specified for explosive materials in the *Fire Code*.

415.6.1.1 Group H-1. Group H-1 occupancies shall be set back not less than 75 feet (22 860 mm) and not less than required by the *Fire Code*.

Exception: Fireworks manufacturing buildings separated in accordance with NFPA 1124.

415.6.1.2 Group H-2. Group H-2 occupancies shall be set back not less than 30 feet (9144 mm) where the area of the occupancy is greater than 1,000 square feet (93 m²) and it is not required to be located in a *detached building*.

415.6.1.3 Groups H-2 and H-3. Group H-2 and H-3 occupancies shall be set back not less than 50 feet (15 240 mm) where a *detached building* is required (see Table 415.6.2).

415.6.1.4 Explosive materials. Group H-2 and H-3 occupancies containing materials with explosive characteristics shall be separated as required by the *Fire Code*. Where separations are not specified, the distances required shall be determined by a technical report issued in accordance with Section 414.1.3.

415.6.2 Detached buildings for Group H-1, H-2 or H-3 occupancy. The storage or use of hazardous materials in excess of those amounts listed in Table 415.6.2 shall be in accordance with the applicable provisions of Sections 415.7 and 415.8.

415.6.2.1 Wall and opening protection. Where a *detached building* is required by Table 415.6.2, there are no requirements for wall and opening protection based on *fire separation distance*.

415.7 Special provisions for Group H-1 occupancies. Group H-1 occupancies shall be in detached buildings used for no other purpose. Roofs shall be of lightweight construction with suitable thermal insulation to prevent sensitive material from reaching its decomposition temperature. Group H-1 occupancies containing materials that are in themselves both physical and health hazards in quantities exceeding the maximum allowable quantities per *control area* in Table 307.1(2) shall comply with requirements for both Group H-1 and H-4 occupancies.

415.7.1 Floors in storage rooms. Floors in storage areas for organic peroxides, pyrophoric materials and unstable (reactive) materials shall be of liquid-tight, noncombustible construction.

415.8 Special provisions for Group H-2 and H-3 occupancies. Group H-2 and H-3 occupancies containing quantities of hazardous materials in excess of those set forth in Table 415.6.2 shall be in *detached buildings* used for manufacturing, processing, dispensing, use or storage of hazardous materials. Materials listed for Group H-1 occupancies in Section 307.3 are permitted to be located within Group H-2 or H-3 *detached buildings* provided the amount of materials per *control area* do not exceed the maximum allowed quantity specified in Table 307.1(1).

415.8.1 Multiple hazards. Group H-2 or H-3 occupancies containing materials that are in themselves both physical and health hazards in quantities exceeding the maximum allowable quantities per *control area* in Table 307.1(2) shall comply with requirements for Group H-2, H-3 or H-4 occupancies as applicable.

415.8.2 Separation of incompatible materials. Hazardous materials other than those listed in Table 415.6.2 shall be allowed in manufacturing, processing, dispensing, use or storage areas when separated from incompatible materials in accordance with the provisions of the *Fire Code*.

415.8.3 Water reactives. Group H-2 and H-3 occupancies containing water-reactive materials shall be resistant to water penetration. Piping for conveying liquids shall not be over or through areas containing water reactives, unless isolated by *approved* liquid-tight construction.

Exception: Fire protection piping shall be permitted over or through areas containing water reactives without isolating it with liquid-tight construction.

415.8.4 Floors in storage rooms. Floors in storage areas for organic peroxides, oxidizers, pyrophoric materials, unstable (reactive) materials and water-reactive solids and liquids shall be of liquid-tight, noncombustible construction.

415.8.5 Waterproof room. Rooms or areas used for the storage of water-reactive solids and liquids shall be constructed in a manner that resists the penetration of water through the use of waterproof materials. Piping carrying water for other than *approved automatic sprinkler systems* shall not be within such rooms or areas.

415.9 Group H-2. Occupancies in Group H-2 shall be constructed in accordance with Sections 415.9.1 through 415.9.3 and the *Fire Code*.

415.9.1 Flammable and combustible liquids. The storage, handling, processing and transporting of flammable and combustible liquids in Group H-2 and H-3 occupancies shall be in accordance with Sections 415.9.1.1 through 415.9.1.9, the *Mechanical Code* and the *Fire Code*.

415.9.1.1 Mixed occupancies. Where the storage tank area is located in a building of two or more occupancies and the quantity of liquid exceeds the maximum allowable quantity for one *control area*, the use shall be completely separated from adjacent occupancies in accordance with the requirements of Section 508.4.

415.9.1.1.1 Height exception. Where storage tanks are located within a building no more than one story above grade plane, the height limitation of Section 504 shall not apply for Group H.

**TABLE 415.6.2
DETACHED BUILDING REQUIRED**

| A DETACHED BUILDING IS REQUIRED WHEN THE QUANTITY OF MATERIAL EXCEEDS THAT LISTED HEREIN | | | |
|--|---------------------------|---|------------------------------------|
| Material | Class | Solids and Liquids (tons) ^{a, b} | Gases (cubic feet) ^{a, b} |
| Explosives | Division 1.1 | Maximum Allowable Quantity | Not Applicable |
| | Division 1.2 | Maximum Allowable Quantity | |
| | Division 1.3 | Maximum Allowable Quantity | |
| | Division 1.4 | Maximum Allowable Quantity | |
| | Division 1.4 ^c | 1 | |
| | Division 1.5 | Maximum Allowable Quantity | |
| Oxidizers | Division 1.6 | Maximum Allowable Quantity | Maximum Allowable Quantity |
| | Class 4 | Maximum Allowable Quantity | |
| Unstable (reactives) detonable | Class 3 or 4 | Maximum Allowable Quantity | Maximum Allowable Quantity |
| Oxidizer, liquids and solids | Class 3 | 1,200 | Not Applicable |
| | Class 2 | 2,000 | Not Applicable |
| Organic peroxides | Detonable | Maximum Allowable Quantity | Not Applicable |
| | Class I | Maximum Allowable Quantity | Not Applicable |
| | Class II | 25 | Not Applicable |
| | Class III | 50 | Not Applicable |
| Unstable (reactives) nondetonable | Class 3 | 1 | 2,000 |
| | Class 2 | 25 | 10,000 |
| Water reactives | Class 3 | 1 | Not Applicable |
| | Class 2 | 25 | Not Applicable |
| Pyrophoric gases | Not Applicable | Not Applicable | 2,000 |

For SI: 1 ton = 906 kg, 1 cubic foot = 0.02832 m³, 1 pound = 0.454 kg.

a. For materials that are detonable, the distance to other buildings or lot lines shall be in accordance with Chapter 56 of the *Fire Code* based on trinitrotoluene (TNT) equivalence of the material. For materials classified as explosives, see Chapter 56 of the *Fire Code*.

b. "Maximum Allowable Quantity" means the maximum allowable quantity per control area set forth in Table 307.1(1).

c. Limited to Division 1.4 materials and articles, including articles packaged for shipment, that are not regulated as an explosive under Bureau of Alcohol, Tobacco, Firearms and Explosives (BATF) regulations or unpackaged articles used in process operations that do not propagate a detonation or deflagration between articles, provided the net explosive weight of individual articles does not exceed 1 pound.

415.9.1.2 Tank protection. Storage tanks shall be non-combustible and protected from physical damage. *Fire barriers* or *horizontal assemblies* or both around the storage tanks shall be permitted as the method of protection from physical damage.

415.9.1.3 Tanks. Storage tanks shall be *approved* tanks conforming to the requirements of the *Fire Code*.

415.9.1.4 Leakage containment. A liquid-tight containment area compatible with the stored liquid shall be provided. The method of spill control, drainage control and secondary containment shall be in accordance with the *Fire Code*.

Exception: Rooms where only double-wall storage tanks conforming to Section 415.9.1.3 are used to store Class I, II and IIIA flammable and combustible liquids shall not be required to have a leakage containment area.

415.9.1.5 Leakage alarm. An *approved* automatic alarm shall be provided to indicate a leak in a storage tank and room. The alarm shall sound an audible signal, 15 dBA above the ambient sound level, at every point of entry into the room in which the leaking storage tank is located. An *approved* sign shall be posted on every entry door to the tank storage room indicating the potential hazard of the interior room environment, or the sign shall state: WARNING, WHEN ALARM SOUNDS, THE ENVIRONMENT WITHIN THE ROOM MAY BE HAZARDOUS. The leakage alarm shall also be supervised in accordance with Chapter 9 to transmit a trouble signal.

415.9.1.6 Tank vent. Storage tank vents for Class I, II or IIIA liquids shall terminate to the outdoor air in accordance with the *Fire Code*.

415.9.1.7 Room ventilation. Storage tank areas storing Class I, II or IIIA liquids shall be provided with mechanical ventilation. The mechanical ventilation system shall be in accordance with the *Mechanical Code* and the *Fire Code*.

415.9.1.8 Explosion venting. Where Class I liquids are being stored, explosion venting shall be provided in accordance with the *Fire Code*.

415.9.1.9 Tank openings other than vents. Tank openings other than vents from tanks inside buildings shall be designed to ensure that liquids or vapor concentrations are not released inside the building.

415.9.2 Liquefied petroleum gas facilities. The construction and installation of liquefied petroleum gas facilities shall be in accordance with the requirements of this code, the *Fire Code*, the *Mechanical Code*, the *Fuel Gas Code* and NFPA 58.

415.9.3 Dry cleaning plants. The construction and installation of dry cleaning plants shall be in accordance with the requirements of this code, the *Mechanical Code*, the *Plumbing Code* and NFPA 32. Dry cleaning solvents and

systems shall be classified in accordance with the *Fire Code*.

415.10 Groups H-3 and H-4. Groups H-3 and H-4 shall be constructed in accordance with the applicable provisions of this code and the *Fire Code*.

415.10.1 Flammable and combustible liquids. The storage, handling, processing and transporting of flammable and combustible liquids in Group H-3 occupancies shall be in accordance with Section 415.9.1.

415.10.2 Gas rooms. Where gas rooms are provided, such rooms shall be separated from other areas by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

415.10.3 Floors in storage rooms. Floors in storage areas for corrosive liquids and highly toxic or toxic materials shall be of liquid-tight, noncombustible construction.

415.10.4 Separation-highly toxic solids and liquids. Highly toxic solids and liquids not stored in *approved* hazardous materials storage cabinets shall be isolated from other hazardous materials storage by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

415.11 Group H-5. In addition to the requirements set forth elsewhere in this code, Group H-5 shall comply with the provisions of Sections 415.11.1 through 415.11.11 and the *Fire Code*.

415.11.1 Fabrication areas. *Fabrication areas* shall comply with Sections 415.11.1.1 through 415.11.1.8.

415.11.1.1 Hazardous materials. Hazardous materials and hazardous production materials (HPM) shall comply with Sections 415.11.1.1.1 and 415.11.1.1.2.

415.11.1.1.1 Aggregate quantities. The aggregate quantities of hazardous materials stored and used in a single *fabrication area* shall not exceed the quantities set forth in Table 415.11.1.1.1.

Exception: The quantity limitations for any hazard category in Table 415.11.1.1.1 shall not apply where the *fabrication area* contains quantities of hazardous materials not exceeding the maximum allowable quantities per *control area* established by Tables 307.1(1) and 307.1(2).

415.11.1.1.2 Hazardous production materials. The maximum quantities of hazardous production materials (HPM) stored in a single *fabrication area* shall not exceed the maximum allowable quantities per *control area* established by Tables 307.1(1) and 307.1(2).

415.11.1.2 Separation. *Fabrication areas*, whose sizes are limited by the quantity of hazardous materials allowed by Table 415.11.1.1.1, shall be separated from each other, from *corridors* and from other parts of the building by not less than 1-hour *fire barriers* con-

structed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

Exceptions:

1. Doors within such *fire barrier* walls, including doors to *corridors*, shall be only *self-closing fire door assemblies* having a *fire protection rating* of not less than $\frac{3}{4}$ hour.
2. Windows between *fabrication areas* and *corridors* are permitted to be fixed glazing listed and labeled for a *fire protection rating* of not less than $\frac{3}{4}$ hour in accordance with Section 716.

415.11.1.3 Location of occupied levels. Occupied levels of *fabrication areas* shall be located at or above the first story above grade plane.

415.11.1.4 Floors. Except for surfacing, floors within *fabrication areas* shall be of noncombustible construction.

Openings through floors of *fabrication areas* are permitted to be unprotected where the interconnected levels are used solely for mechanical equipment directly related to such *fabrication areas* (see also Section 415.11.1.5).

Floors forming a part of an occupancy separation shall be liquid tight.

415.11.1.5 Shafts and openings through floors. Elevator hoistways, vent *shafts* and other openings through floors shall be enclosed where required by Sections 712 and 713. Mechanical, duct and piping penetrations within a *fabrication area* shall not extend through more than two floors. The *annular space* around penetrations for cables, cable trays, tubing, piping, conduit or ducts shall be sealed at the floor level to restrict the movement of air. The *fabrication area*, including the areas through which the ductwork and piping extend, shall be considered a single conditioned environment.

415.11.1.6 Ventilation. Mechanical exhaust *ventilation* at the rate of not less than 1 cubic foot per minute per square foot [$0.0051 \text{ m}^3/(\text{s} \cdot \text{m}^2)$] of floor area shall be provided throughout the portions of the *fabrication area* where HPM are used or stored. The exhaust air duct system of one *fabrication area* shall not connect to another duct system outside that *fabrication area* within the building.

A *ventilation* system shall be provided to capture and exhaust gases, fumes and vapors at workstations.

Two or more operations at a workstation shall not be connected to the same exhaust system where either one or the combination of the substances removed could constitute a fire, explosion or hazardous chemical reaction within the exhaust duct system.

Exhaust ducts penetrating *fire barriers* constructed in accordance with Section 707 or *horizontal assem-*

blies constructed in accordance with Section 711 shall be contained in a *shaft* of equivalent fire-resistance-rated construction. Exhaust ducts shall not penetrate *fire walls*.

Fire dampers shall not be installed in exhaust ducts.

415.11.1.7 Transporting hazardous production materials to fabrication areas. HPM shall be transported to *fabrication areas* through enclosed piping or tubing systems that comply with Section 415.11.6, through *service corridors* complying with Section 415.11.3, or in *corridors* as permitted in the exception to Section 415.11.2. The handling or transporting of HPM within *service corridors* shall comply with the *Fire Code*.

415.11.1.8 Electrical. Electrical equipment and devices within the *fabrication area* shall comply with NFPA 70. The requirements for hazardous locations need not be applied where the average air change is at least four times that set forth in Section 415.11.1.6 and where the number of air changes at any location is not less than three times that required by Section 415.11.1.6. The use of recirculated air shall be permitted.

415.11.1.8.1 Workstations. Workstations shall not be energized without adequate exhaust *ventilation*. See Section 415.11.1.6 for workstation exhaust *ventilation* requirements.

415.11.2 Corridors. *Corridors* shall comply with Chapter 10 and shall be separated from *fabrication areas* as specified in Section 415.11.1.2. *Corridors* shall not contain HPM and shall not be used for transporting such materials except through closed piping systems as provided in Section 415.11.6.4

Exception: Where existing *fabrication areas* are altered or modified, HPM is allowed to be transported in existing *corridors*, subject to the following conditions:

1. Nonproduction HPM is allowed to be transported in *corridors* if utilized for maintenance, lab work and testing.
2. Where existing *fabrication areas* are altered or modified, HPM is allowed to be transported in existing *corridors*, subject to the following conditions:
 - 2.1. *Corridors* adjacent to the *fabrication area* where the alteration work is to be done shall comply with Section 1020 for a length determined as follows:
 - 2.1.1. The length of the common wall of the *corridor* and the *fabrication area*; and
 - 2.1.2. For the distance along the *corridor* to the point of entry of HPM into the *corridor* serving that *fabrication area*.

SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY

**TABLE 415.11.1.1.1
QUANTITY LIMITS FOR HAZARDOUS MATERIALS IN A SINGLE FABRICATION AREA IN GROUP H-5^a**

| HAZARD CATEGORY | | SOLIDS (pounds per square foot) | LIQUIDS (gallons per square foot) | GAS (cubic feet @ NTP/square foot) |
|--------------------------------------|--|------------------------------------|--------------------------------------|---------------------------------------|
| PHYSICAL-HAZARD MATERIALS | | | | |
| Combustible dust | | Note b | Not Applicable | Not Applicable |
| Combustible fiber | Loose Baled | Note b Notes b, c | Not Applicable | Not Applicable |
| Combustible liquid | II IIIA IIIB | Not Applicable | 0.01 0.02 Not Limited | Not Applicable |
| Combination Class | I, II and IIIA | | 0.04 | |
| Cryogenic gas | Flammable Oxidizing | Not Applicable | Not Applicable | Note d 1.25 |
| Explosives | | Note b | Note b | Note b |
| Flammable gas | Gaseous Liquefied | Not Applicable | Not Applicable | Note d Note d |
| Flammable liquid | IA IB IC | Not Applicable | 0.0025 0.025 0.025 | Not Applicable |
| Combination Class | IA, IB and IC | | 0.025 | |
| Combination Class | I, II and IIIA | | 0.04 | |
| Flammable solid | | 0.001 | Not Applicable | Not Applicable |
| Organic peroxide | Unclassified detonable | | Not Applicable | Not Applicable |
| | Class I | Note b | | |
| | Class II | Note b | | |
| | Class III | 0.025 | | |
| | Class IV | 0.1 | | |
| | Class V | Not Limited | | |
| Oxidizing gas | Gaseous Liquefied | Not Applicable | Not Applicable | 1.25 1.25 |
| Combination of gaseous and liquefied | | | | 1.25 |
| Oxidizer | Class 4 Class 3 Class 2 Class 1 | Note b 0.003 0.003 0.003 | Note b 0.03 0.03 0.03 | Not Applicable |
| Combination Class | 1, 2, 3 | 0.003 | 0.03 | |
| Pyrophoric materials | | 0.01 | 0.00125 | Notes d and e |
| Unstable (reactive) | Class 4 | Note b | Note b | Note b |
| | Class 3 | 0.025 | 0.0025 | Note b |
| | Class 2 | 0.1 | 0.01 | Note b |
| | Class 1 | Not Limited | Not Limited | Not Limited |
| Water reactive | Class 3 | Note b | 0.00125 | Not Applicable |
| | Class 2 | 0.25 | 0.025 | |
| | Class 1 | Not Limited | Not Limited | |
| HEALTH-HAZARD MATERIALS | | | | |
| Corrosives | | Not Limited | Not Limited | Not Limited |
| Highly toxic | | Not Limited | Not Limited | Note d |
| Toxics | | Not Limited | Not Limited | Note d |

For SI: 1 pound per square foot = 4.882 kg/m², 1 gallon per square foot = 40.7 L/m², 1 cubic foot @ NTP/square foot = 0.305 m³ @ NTP/m²,
1 cubic foot = 0.02832 m³.

- Hazardous materials within piping shall not be included in the calculated quantities.
- Quantity of hazardous materials in a single fabrication shall not exceed the maximum allowable quantities per control area in Tables 307.1(1) and 307.1(2).
- Densely packed baled cotton that complies with the packing requirements of ISO 8115 shall not be included in this material class.
- The aggregate quantity of flammable, pyrophoric, toxic and highly toxic gases shall not exceed 9,000 cubic feet at NTP.
- The aggregate quantity of pyrophoric gases in the building shall not exceed the amounts set forth in Table 415.6.2.

2.2. *Emergency alarm system.* There shall be an emergency telephone system, a local manual alarm station or other *approved* alarm-initiating device within *corridors* at not more than 150-foot (45 720 mm) intervals and at each *exit* and doorway. The signal shall be relayed to an *approved* central, proprietary or remote station service or the emergency control station and shall also initiate a local audible alarm.

2.3. *Pass-throughs.* *Self-closing* doors having a *fire protection rating* of not less than 1 hour shall separate pass-throughs from existing *corridors*. Pass-throughs shall be constructed as required for the *corridors* and protected by an *approved automatic sprinkler system*.

415.11.3 Service corridors. *Service corridors* within a Group H-5 occupancy shall comply with Sections 415.11.3.1 through 415.11.3.4.

415.11.3.1 Use conditions. *Service corridors* shall be separated from *corridors* as required by Section 415.11.1.2. *Service corridors* shall not be used as a required *corridor*.

415.11.3.2 Mechanical ventilation. *Service corridors* shall be mechanically ventilated as required by Section 415.11.1.6 or at not less than six air changes per hour.

415.11.3.3 Means of egress. The distance of travel from any point in a *service corridor* to an *exit*, *exit access corridor* or door into a *fabrication area* shall be not greater than 75 feet (22 860 mm). Dead ends shall be not greater than 4 feet (1219 mm) in length. There shall be not less than two *exits*, and not more than one-half of the required *means of egress* shall require travel into a *fabrication area*. Doors from *service corridors* shall swing in the direction of egress travel and shall be *self-closing*.

415.11.3.4 Minimum width. The clear width of a *service corridor* shall be not less than 5 feet (1524 mm), or 33 inches (838 mm) wider than the widest cart or truck used in the *service corridor*, whichever is greater.

415.11.3.5 Emergency alarm system. *Emergency alarm systems* shall be provided in accordance with this section and Sections 415.5.1 and 415.5.2. The maximum allowable quantity per *control area* provisions shall not apply to *emergency alarm systems* required for HPM.

415.11.3.5.1 Service corridors. An *emergency alarm system* shall be provided in *service corridors*, with no fewer than one alarm device in each *service corridor*.

415.11.3.5.2 Corridors and interior exit stairways and ramps. Emergency alarms for *corridors*, *interior exit stairways* and *ramps* and *exit passageways* shall comply with Section 415.5.2.

415.11.3.5.3 Liquid storage rooms, HPM rooms and gas rooms. Emergency alarms for liquid stor-

age rooms, HPM rooms and gas rooms shall comply with Section 415.5.1.

415.11.3.5.4 Alarm-initiating devices. An *approved* emergency telephone system, local alarm manual pull stations, or other *approved* alarm-initiating devices are allowed to be used as emergency alarm-initiating devices.

415.11.3.5.5 Alarm signals. Activation of the *emergency alarm system* shall sound a local alarm and transmit a signal to the emergency control station.

415.11.4 Storage of hazardous production materials. Storage of hazardous production materials (HPM) in *fabrication areas* shall be within *approved* or *listed* storage cabinets or gas cabinets or within a workstation. The storage of HPM in quantities greater than those listed in Section 5004.2 of the *Fire Code* shall be in liquid storage rooms, HPM rooms or gas rooms as appropriate for the materials stored. The storage of other hazardous materials shall be in accordance with other applicable provisions of this code and the *Fire Code*.

415.11.5 HPM rooms, gas rooms, liquid storage room construction. HPM rooms, gas rooms and liquid shall be constructed in accordance with Sections 415.11.5.1 through 415.11.5.9.

415.11.5.1 HPM rooms and gas rooms. HPM rooms and gas rooms shall be separated from other areas by *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The *fire-resistance rating* shall be not less than 2 hours where the area is 300 square feet (27.9 m²) or more and not less than 1 hour where the area is less than 300 square feet (27.9 m²).

415.11.5.2 Liquid storage rooms. Liquid storage rooms shall be constructed in accordance with the following requirements:

1. Rooms greater than 500 square feet (46.5 m²) in area, shall have no fewer than one exterior door *approved* for fire department access.
2. Rooms shall be separated from other areas by *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The *fire-resistance rating* shall be not less than 1 hour for rooms up to 150 square feet (13.9 m²) in area and not less than 2 hours where the room is more than 150 square feet (13.9 m²) in area.
3. Shelving, racks and wainscoting in such areas shall be of noncombustible construction or wood of not less than 1-inch (25 mm) nominal thickness or fire-retardant-treated wood complying with Section 2303.2.
4. Rooms used for the storage of Class I flammable liquids shall not be located in a *basement*.

415.11.5.3 Floors. Except for surfacing, floors of HPM rooms and liquid storage rooms shall be of noncombust-

tible liquid-tight construction. Raised grating over floors shall be of noncombustible materials.

415.11.5.4 Location. Where HPM rooms, liquid storage rooms and gas rooms are provided, they shall have no fewer than one *exterior wall* and such wall shall be not less than 30 feet (9144 mm) from *lot lines*, including *lot lines* adjacent to *public ways*.

415.11.5.5 Explosion control. Explosion control shall be provided where required by Section 414.5.1.

415.11.5.6 Exits. Where two *exits* are required from HPM rooms, liquid storage rooms and gas rooms, one shall be directly to the outside of the building.

415.11.5.7 Doors. Doors in a *fire barrier wall*, including doors to *corridors*, shall be *self-closing fire door assemblies* having a *fire protection rating* of not less than $\frac{3}{4}$ hour.

415.11.5.8 Ventilation. Mechanical exhaust ventilation shall be provided in liquid storage rooms, HPM rooms and gas rooms at the rate of not less than 1 cubic foot per minute per square foot (0.044 L/s/m²) of floor area or six air changes per hour.

Exhaust ventilation for gas rooms shall be designed to operate at a negative pressure in relation to the surrounding areas and direct the exhaust ventilation to an exhaust system.

415.11.5.9 Emergency alarm system. An *approved emergency alarm system* shall be provided for HPM rooms, liquid storage rooms and gas rooms.

Emergency alarm-initiating devices shall be installed outside of each interior *exit* door of such rooms.

Activation of an emergency alarm-initiating device shall sound a local alarm and transmit a signal to the emergency control station.

An *approved* emergency telephone system, local alarm manual pull stations or other *approved* alarm-initiating devices are allowed to be used as emergency alarm-initiating devices.

415.11.6 Piping and tubing. Hazardous production materials piping and tubing shall comply with this section and ASME B31.3.

415.11.6.1 HPM having a health-hazard ranking of 3 or 4. Systems supplying HPM liquids or gases having a health-hazard ranking of 3 or 4 shall be welded throughout, except for connections, to the systems that are within a ventilated enclosure if the material is a gas, or an *approved* method of drainage or containment is provided for the connections if the material is a liquid.

415.11.6.2 Location in service corridors. Hazardous production materials supply piping or tubing in *service corridors* shall be exposed to view.

415.11.6.3 Excess flow control. Where HPM gases or liquids are carried in pressurized piping above 15 pounds per square inch gauge (psig) (103.4 kPa),

excess flow control shall be provided. Where the piping originates from within a liquid storage room, HPM room or gas room, the excess flow control shall be located within the liquid storage room, HPM room or gas room. Where the piping originates from a bulk source, the excess flow control shall be located as close to the bulk source as practical.

415.11.6.4 Installations in corridors and above other occupancies. The installation of HPM piping and tubing within the space defined by the walls of *corridors* and the floor or roof above, or in concealed spaces above other occupancies, shall be in accordance with Sections 415.11.6.1 through 415.11.6.3 and the following conditions:

1. Automatic sprinklers shall be installed within the space unless the space is less than 6 inches (152 mm) in the least dimension.
2. *Ventilation* not less than six air changes per hour shall be provided. The space shall not be used to convey air from any other area.
3. Where the piping or tubing is used to transport HPM liquids, a receptor shall be installed below such piping or tubing. The receptor shall be designed to collect any discharge or leakage and drain it to an *approved* location. The 1-hour enclosure shall not be used as part of the receptor.
4. HPM supply piping and tubing and nonmetallic waste lines shall be separated from the corridor and from occupancies other than Group H-5 by fire barriers or by an approved method or assembly that has a fire-resistance rating of not less than 1 hour. Access openings into the enclosure shall be protected by approved fire-protection-rated assemblies.
5. Readily accessible manual or automatic remotely activated fail-safe emergency shutoff valves shall be installed on piping and tubing other than waste lines at the following locations:

5.1. At branch connections into the *fabrication area*.

5.2. At entries into *corridors*.

Exception: Transverse crossings of the *corridors* by supply piping that is enclosed within a ferrous pipe or tube for the width of the *corridor* need not comply with Items 1 through 5.

415.11.6.5 Identification. Piping, tubing and HPM waste lines shall be identified in accordance with ANSI A13.1 to indicate the material being transported.

415.11.7 Continuous gas detection systems. A *continuous gas detection system* shall be provided for HPM gases where the physiological warning threshold level of the gas is at a higher level than the accepted permissible exposure limit (PEL) for the gas and for flammable gases in accordance with Sections 415.11.7.1 and 415.11.7.2.

415.11.7.1 Where required. A *continuous gas detection system* shall be provided in the areas identified in Sections 415.11.7.1.1 through 415.11.7.1.4.

415.11.7.1.1 Fabrication areas. A *continuous gas detection system* shall be provided in *fabrication areas* where gas is used in the *fabrication area*.

415.11.7.1.2 HPM rooms. A *continuous gas detection system* shall be provided in HPM rooms where gas is used in the room.

415.11.7.1.3 Gas cabinets, exhausted enclosures and gas rooms. A *continuous gas detection system* shall be provided in gas cabinets and exhausted enclosures. A *continuous gas detection system* shall be provided in gas rooms where gases are not located in gas cabinets or exhausted enclosures.

415.11.7.1.4 Corridors. Where gases are transported in piping placed within the space defined by the walls of a *corridor* and the floor or roof above the *corridor*, a *continuous gas detection system* shall be provided where piping is located and in the *corridor*.

Exception: A *continuous gas detection system* is not required for occasional transverse crossings of the *corridors* by supply piping that is enclosed in a ferrous pipe or tube for the width of the *corridor*.

415.11.7.2 Gas detection system operation. The *continuous gas detection system* shall be capable of monitoring the room, area or equipment in which the gas is located at or below all the following gas concentrations:

1. Immediately dangerous to life and health (IDLH) values where the monitoring point is within an exhausted enclosure, ventilated enclosure or gas cabinet.
2. Permissible exposure limit (PEL) levels where the monitoring point is in an area outside an exhausted enclosure, ventilated enclosure or gas cabinet.
3. For flammable gases, the monitoring detection threshold level shall be vapor concentrations in excess of 25 percent of the lower flammable limit (LFL) where the monitoring is within or outside an exhausted enclosure, ventilated enclosure or gas cabinet.
4. Except as noted in this section, monitoring for highly toxic and toxic gases shall also comply with Chapter 60 of the *Fire Code*.

415.11.7.2.1 Alarms. The gas detection system shall initiate a local alarm and transmit a signal to the emergency control station when a short-term hazard condition is detected. The alarm shall be both visual and audible and shall provide warning both inside and outside the area where the gas is detected. The audible alarm shall be distinct from all other alarms.

415.11.7.2.2 Shutoff of gas supply. The gas detection system shall automatically close the shutoff valve at the source on gas supply piping and tubing related to the system being monitored for which gas is detected when a short-term hazard condition is detected. Automatic closure of shutoff valves shall comply with the following:

1. Where the gas detection sampling point initiating the gas detection system alarm is within a gas cabinet or exhausted enclosure, the shutoff valve in the gas cabinet or exhausted enclosure for the specific gas detected shall automatically close.
2. Where the gas detection sampling point initiating the gas detection system alarm is within a room and compressed gas containers are not in gas cabinets or an exhausted enclosure, the shutoff valves on all gas lines for the specific gas detected shall automatically close.
3. Where the gas detection sampling point initiating the gas detection system alarm is within a piping distribution manifold enclosure, the shutoff valve supplying the manifold for the compressed gas container of the specific gas detected shall automatically close.

Exception: Where the gas detection sampling point initiating the gas detection system alarm is at the use location or within a gas valve enclosure of a branch line downstream of a piping distribution manifold, the shutoff valve for the branch line located in the piping distribution manifold enclosure shall automatically close.

415.11.8 Manual fire alarm system. An *approved* manual *fire alarm* system shall be provided throughout buildings containing Group H-5. Activation of the alarm system shall initiate a local alarm and transmit a signal to the emergency control station. The *fire alarm* system shall be designed and installed in accordance with Section 907.

415.11.9 Emergency control station. An emergency control station shall be provided in accordance with Sections 415.11.9.1 through 415.11.9.3.

415.11.9.1 Location. The emergency control station shall be located on the premises at an *approved* location outside the *fabrication area*.

415.11.9.2 Staffing. Trained personnel shall continuously staff the emergency control station.

415.11.9.3 Signals. The emergency control station shall receive signals from emergency equipment and alarm and detection systems. Such emergency equipment and alarm and detection systems shall include, but not be limited to, the following where such equipment or systems are required to be provided either in this chapter or elsewhere in this code:

1. *Automatic sprinkler system* alarm and monitoring systems.

2. Manual *fire alarm* systems.
3. *Emergency alarm* systems.
4. *Continuous gas detection* systems.
5. Smoke detection systems.
6. Emergency power system.
7. Automatic detection and alarm systems for pyrophoric liquids and Class 3 water-reactive liquids required in Section 2705.2.3.4 of the *Fire Code*.
8. Exhaust *ventilation* flow alarm devices for pyrophoric liquids and Class 3 water-reactive liquids cabinet exhaust *ventilation* systems required in Section 2705.2.3.4 of the *Fire Code*.

415.11.10 Emergency power system. An emergency power system shall be provided in Group H-5 occupancies in accordance with Section 2702. The emergency power system shall supply power automatically to the electrical systems specified in Section 415.11.10.1 when the normal electrical supply system is interrupted.

415.11.10.1 Required electrical systems. Emergency power shall be provided for electrically operated equipment and connected control circuits for the following systems:

1. HPM exhaust *ventilation* systems.
2. HPM gas cabinet *ventilation* systems.
3. HPM exhausted enclosure *ventilation* systems.
4. HPM gas room *ventilation* systems.
5. HPM gas detection systems.
6. *Emergency alarm* systems.
7. Manual and automatic *fire alarm* systems.
8. *Automatic sprinkler system* monitoring and alarm systems.
9. Automatic alarm and detection systems for pyrophoric liquids and Class 3 water-reactive liquids required in Section 2705.2.3.4 of the *Fire Code*.
10. Flow alarm switches for pyrophoric liquids and Class 3 water-reactive liquids cabinet exhaust *ventilation* systems required in Section 2705.2.3.4 of the *Fire Code*.
11. Electrically operated systems required elsewhere in this code or in the *Fire Code* applicable to the use, storage or handling of HPM.

415.11.10.2 Exhaust ventilation systems. Exhaust *ventilation* systems are allowed to be designed to operate at not less than one-half the normal fan speed on the emergency power system where it is demonstrated that the level of exhaust will maintain a safe atmosphere.

415.11.11 Automatic sprinkler system protection in exhaust ducts for HPM. An *approved automatic sprinkler system* shall be provided in exhaust ducts conveying gases, vapors, fumes, mists or dusts generated from HPM in accordance with Sections 415.11.11.1 through 415.11.11.3 and the *Mechanical Code*.

415.11.11.1 Metallic and noncombustible nonmetallic exhaust ducts. An *approved automatic sprinkler system* shall be provided in metallic and noncombustible nonmetallic exhaust ducts where all of the following conditions apply:

1. Where the largest cross-sectional diameter is equal to or greater than 10 inches (254 mm).
2. The ducts are within the building.
3. The ducts are conveying flammable gases, vapors or fumes.

415.11.11.2 Combustible nonmetallic exhaust ducts. *Automatic sprinkler system* protection shall be provided in combustible nonmetallic exhaust ducts where the largest cross-sectional diameter of the duct is equal to or greater than 10 inches (254 mm).

Exception: Ducts need not be provided with *automatic sprinkler* protection as follows:

1. Ducts *listed* or *approved* for applications without *automatic sprinkler system* protection.
2. Ducts not more than 12 feet (3658 mm) in length installed below ceiling level.

415.11.11.3 Automatic sprinkler locations. Sprinkler systems shall be installed at 12-foot (3658 mm) intervals in horizontal ducts and at changes in direction. In vertical ducts, sprinklers shall be installed at the top and at alternate floor levels.

SECTION 416 APPLICATION OF FLAMMABLE FINISHES

416.1 General. The provisions of this section shall apply to the construction, installation and use of buildings and structures, or parts thereof, for the application of flammable finishes. Such construction and equipment shall comply with the *Fire Code*.

416.2 Spray rooms. Spray rooms shall be enclosed with not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. Floors shall be waterproofed and drained in an *approved* manner.

416.2.1 Surfaces. The interior surfaces of spray rooms shall be smooth and shall be so constructed to permit the free passage of exhaust air from all parts of the interior and to facilitate washing and cleaning, and shall be so designed to confine residues within the room. Aluminum shall not be used.

416.2.2 Ventilation. Mechanical *ventilation* and interlocks with the spraying operation shall be in accordance with the *Mechanical Code*.

416.3 Spraying spaces. Spraying spaces shall be ventilated with an exhaust system to prevent the accumulation of flammable mist or vapors in accordance with the *Mechanical Code*. Where such spaces are not separately enclosed, noncombustible spray curtains shall be provided to restrict the spread of flammable vapors.

416.3.1 Surfaces. The interior surfaces of spraying spaces shall be smooth and continuous without edges; shall be so constructed to permit the free passage of exhaust air from all parts of the interior and to facilitate washing and cleaning; and shall be so designed to confine residues within the spraying space. Aluminum shall not be used.

416.4 Spray booths. Spray booths shall be designed, constructed and operated in accordance with the *Fire Code*.

416.5 Fire protection. An *automatic sprinkler system* or *fire-extinguishing system* shall be provided in all spray, dip and immersing spaces and storage rooms and shall be installed in accordance with Chapter 9.

SECTION 417 DRYING ROOMS

417.1 General. A drying room or dry kiln installed within a building shall be constructed entirely of *approved* noncombustible materials or assemblies of such materials regulated by the *approved* rules or as required in the general and specific sections of this chapter for special occupancies and where applicable to the general requirements of the *Mechanical Code*.

417.2 Piping clearance. Overhead heating pipes shall have a clearance of not less than 2 inches (51 mm) from combustible contents in the dryer.

417.3 Insulation. Where the operating temperature of the dryer is 175°F (79°C) or more, metal enclosures shall be insulated from adjacent combustible materials by not less than 12 inches (305 mm) of airspace, or the metal walls shall be lined with 1/4-inch (6.4 mm) insulating mill board or other *approved* equivalent insulation.

417.4 Fire protection. Drying rooms designed for high-hazard materials and processes, including special occupancies as provided for in Chapter 4, shall be protected by an *approved automatic fire-extinguishing system* complying with the provisions of Chapter 9.

SECTION 418 ORGANIC COATINGS

418.1 Building features. Manufacturing of organic coatings shall be done only in buildings that do not have pits or *basements*.

418.2 Location. Organic coating manufacturing operations and operations incidental to or connected therewith shall not be located in buildings having other occupancies.

418.3 Process mills. Mills operating with close clearances and that process flammable and heat-sensitive materials, such as nitrocellulose, shall be located in a *detached building* or noncombustible structure.

418.4 Tank storage. Storage areas for flammable and combustible liquid tanks inside of structures shall be located at or above grade and shall be separated from the processing area by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

418.5 Nitrocellulose storage. Nitrocellulose storage shall be located on a detached pad or in a separate structure or a room enclosed with not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

418.6 Finished products. Storage rooms for finished products that are flammable or combustible liquids shall be separated from the processing area by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

SECTION 419 LIVE/WORK UNITS

419.1 General. A *live/work unit* shall comply with Sections 419.1 through 419.9.

Exception: Dwelling or sleeping units that include an office that is less than 10 percent of the area of the *dwelling unit* are permitted to be classified as *dwelling units* with accessory occupancies in accordance with Section 508.2.

419.1.1 Limitations. The following shall apply to all live/work areas:

1. The *live/work unit* is permitted to be not greater than 3,000 square feet (279 m²) in area;
2. The nonresidential area is permitted to be not more than 50 percent of the area of each *live/work unit*;
3. The nonresidential area function shall be limited to the first or main floor only of the *live/work unit*; and
4. Not more than five nonresidential workers or employees are allowed to occupy the nonresidential area at any one time.

419.2 Occupancies. *Live/work units* shall be classified as a Group R-2 occupancy. Separation requirements found in Sections 420 and 508 shall not apply within the *live/work unit* where the *live/work unit* is in compliance with Section 419. Nonresidential uses that would otherwise be classified as either a Group H or S occupancy shall not be permitted in a *live/work unit*.

Exception: Storage shall be permitted in the *live/work unit* provided the aggregate area of storage in the nonresidential portion of the *live/work unit* shall be limited to 10 percent of the space dedicated to nonresidential activities.

419.3 Means of egress. Except as modified by this section, the *means of egress* components for a *live/work unit* shall be designed in accordance with Chapter 10 for the function served.

419.3.1 Egress capacity. The egress capacity for each element of the *live/work unit* shall be based on the occupant load for the function served in accordance with Table 1004.1.2.

419.3.2 Spiral stairways. *Spiral stairways* that conform to the requirements of Section 1011.10 shall be permitted.

419.4 Vertical openings. Floor openings between floor levels of a *live/work unit* are permitted without enclosure.

419.5 Fire protection. The *live/work unit* shall be provided with a monitored *fire alarm* system where required by Section 907.2.9 and an *automatic sprinkler system* in accordance with Section 903.2.8.

419.6 Structural. Floors within a *live/work unit* shall be designed for the live loads in Table 1607.1, based on the function within the space.

419.7 Accessibility. Accessibility shall be designed in accordance with Chapter 11 for the function served.

419.8 Ventilation. The applicable *ventilation* requirements of the *Mechanical Code* shall apply to each area within the *live/work unit* for the function within that space.

419.9 Plumbing facilities. The nonresidential area of the *live/work unit* shall be provided with minimum plumbing facilities as specified by Chapter 29, based on the function of the nonresidential area. Where the nonresidential area of the *live/work unit* is required to be *accessible* by Section 1107.6.2.1, the plumbing fixtures specified by Chapter 29 shall be *accessible*.

SECTION 420 GROUPS I-1, R-1, R-2, R-3 AND R-4

420.1 General. Occupancies in Groups I-1, R-1, R-2, R-3 and R-4 shall comply with the provisions of Sections 420.1 through 420.6 and other applicable provisions of this code.

420.2 Separation walls. Walls separating *dwelling units* in the same building, walls separating *sleeping units* in the same building and walls separating *dwelling* or *sleeping units* from other occupancies contiguous to them in the same building shall be constructed as *fire partitions* in accordance with Section 708.

420.3 Horizontal separation. Floor assemblies separating *dwelling units* in the same buildings, floor assemblies separating *sleeping units* in the same building and floor assemblies separating *dwelling* or *sleeping units* from other occupancies contiguous to them in the same building shall be constructed as *horizontal assemblies* in accordance with Section 711.

420.4 Smoke barriers in Group I-1, Condition 2. Smoke barriers shall be provided in Group I-1, Condition 2, to subdivide every story used by persons receiving care, treatment or sleeping and to provide other stories with an occupant load of 50 or more persons, into no fewer than two smoke compartments. Such stories shall be divided into smoke compartments with an area of not more than 22,500 square feet (2092 m²) and the distance of travel from any point in a smoke compartment to a smoke barrier door shall not exceed 200 feet (60 960 mm). The smoke barrier shall be in accordance with Section 709.

420.4.1 Refuge area. Refuge areas shall be provided within each smoke compartment. The size of the refuge area shall accommodate the occupants and care recipients from the adjoining smoke compartment. Where a smoke compartment is adjoined by two or more smoke compart-

ments, the minimum area of the refuge area shall accommodate the largest occupant load of the adjoining compartments. The size of the refuge area shall provide the following:

1. Not less than 15 net square feet (1.4 m²) for each care recipient.
2. Not less than 6 net square feet (0.56 m²) for other occupants.

Areas or spaces permitted to be included in the calculation of the refuge area are corridors, lounge or dining areas and other low-hazard areas.

420.5 Automatic sprinkler system. Group R occupancies shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.2.8. Group I-1 occupancies shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.2.6. Quick-response or residential automatic sprinklers shall be installed in accordance with Section 903.3.2.

420.6 Fire alarm systems and smoke alarms. Fire alarm systems and smoke alarms shall be provided in Group I-1, R-1, R-2 and R-4 occupancies in accordance with Sections 907.2.6, 907.2.8, 907.2.9 and 907.2.10, respectively. Single- or multiple- station smoke alarms shall be provided in Groups I-1, R-2, R-3 and R-4 in accordance with Section 907.2.11.

SECTION 421 HYDROGEN FUEL GAS ROOMS

421.1 General. Where required by the *Fire Code*, hydrogen fuel gas rooms shall be designed and constructed in accordance with Sections 421.1 through 421.7.

421.2 Definitions. The following terms are defined in Chapter 2:

GASEOUS HYDROGEN SYSTEM.

HYDROGEN FUEL GAS ROOM.

421.3 Location. Hydrogen fuel gas rooms shall not be located below grade.

421.4 Design and construction. Hydrogen fuel gas rooms not classified as Group H shall be separated from other areas of the building in accordance with Section 509.1.

421.4.1 Pressure control. Hydrogen fuel gas rooms shall be provided with a ventilation system designed to maintain the room at a negative pressure in relation to surrounding rooms and spaces.

421.4.2 Windows. Operable windows in interior walls shall not be permitted. Fixed windows shall be permitted where in accordance with Section 716.

421.5 Exhaust ventilation. Hydrogen fuel gas rooms shall be provided with mechanical exhaust ventilation in accordance with the applicable provisions of Section 502.16.1 of the *Mechanical Code*.

421.6 Gas detection system. Hydrogen fuel gas rooms shall be provided with an approved flammable gas detection system in accordance with Sections 421.6.1 through 421.6.4.

421.6.1 System design. The flammable gas detection system shall be listed for use with hydrogen and any other flammable gases used in the hydrogen fuel gas room. The gas detection system shall be designed to activate when the level of flammable gas exceeds 25 percent of the lower flammability limit (LFL) for the gas or mixtures present at their anticipated temperature and pressure.

421.6.2 Gas detection system components. Gas detection system control units shall be listed and labeled in accordance with UL 864 or UL 2017. Gas detectors shall be listed and labeled in accordance with UL 2075 for use with the gases and vapors being detected.

421.6.3 Operation. Activation of the gas detection system shall result in all of the following:

1. Initiation of distinct audible and visual alarm signals both inside and outside of the hydrogen fuel gas room.
2. Activation of the mechanical exhaust ventilation system.

421.6.4 Failure of the gas detection system. Failure of the gas detection system shall result in activation of the mechanical exhaust ventilation system, cessation of hydrogen generation and the sounding of a trouble signal in an approved location.

421.7 Explosion control. Explosion control shall be provided where required by Section 414.5.1.

421.8 Standby power. Mechanical *ventilation* and gas detection systems shall be provided with a standby power system in accordance with Section 2702.

SECTION 422 AMBULATORY CARE FACILITIES

422.1 General. Occupancies classified as *ambulatory care facilities* shall comply with the provisions of Sections 422.1 through 422.5 and other applicable provisions of this code.

422.2 Separation. *Ambulatory care facilities* where the potential for four or more care recipients are to be *incapable of self-preservation* at any time, whether rendered incapable by staff or staff accepted responsibility for a care recipient already incapable, shall be separated from adjacent spaces, *corridors* or tenants with a *fire partition* installed in accordance with Section 708.

422.3 Smoke compartments. Where the aggregate area of one or more *ambulatory care facilities* is greater than 10,000 square feet (929 m²) on one *story*, the *story* shall be provided with a *smoke barrier* to subdivide the *story* into no fewer than two *smoke compartments*. The area of any one such *smoke compartment* shall be not greater than 22,500 square feet (2092 m²). The distance of travel from any point in a *smoke compartment* to a *smoke barrier* door shall be not greater than 200 feet (60 960 mm). The *smoke barrier* shall be installed in accordance with Section 709 with the exception that *smoke barriers* shall be continuous from outside wall to an outside wall, a floor to a floor, or from a *smoke barrier* to a *smoke barrier* or a combination thereof.

422.3.1 Means of egress. Where ambulatory care facilities require smoke compartmentation in accordance with Section 422.3, the fire safety evacuation plans provided in accordance with Section 1001.4 shall identify the building components necessary to support a *defend-in-place* emergency response in accordance with Sections 404 and 408 of the *Fire Code*.

422.3.2 Refuge area. Not less than 30 net square feet (2.8 m²) for each nonambulatory care recipient shall be provided within the aggregate area of *corridors*, care recipient rooms, treatment rooms, lounge or dining areas and other low-hazard areas within each *smoke compartment*. Each occupant of an *ambulatory care facility* shall be provided with access to a refuge area without passing through or utilizing adjacent tenant spaces.

422.3.3 Independent egress. A *means of egress* shall be provided from each *smoke compartment* created by smoke barriers without having to return through the *smoke compartment* from which *means of egress* originated.

422.4 Automatic sprinkler systems. *Automatic sprinkler systems* shall be provided for *ambulatory care facilities* in accordance with Section 903.2.2.

422.5 Fire alarm systems. A *fire alarm* system shall be provided for *ambulatory care facilities* in accordance with Section 907.2.2.

SECTION 423 STORM SHELTERS

423.1 General. In addition to other applicable requirements in this code, storm shelters shall be constructed in accordance with ICC 500.

423.1.1 Scope. This section applies to the construction of storm shelters constructed as separate detached buildings or constructed as safe rooms within buildings for the purpose of providing safe refuge from storms that produce high winds, such as tornados and hurricanes. Such structures shall be designated to be hurricane shelters, tornado shelters, or combined hurricane and tornado shelters.

423.2 Definitions. The following terms are defined in Chapter 2:

STORM SHELTER.

Community storm shelter.

Residential storm shelter.

423.3 Critical emergency operations. In areas where the shelter design wind speed for tornados in accordance with Figure 304.2(1) of ICC 500 is 250 MPH, 911 call stations, emergency operation centers and fire, rescue, ambulance and police stations shall have a storm shelter constructed in accordance with ICC 500.

Exception: Buildings meeting the requirements for shelter design in ICC 500.

423.4 Group E occupancies. In areas where the shelter design wind speed for tornados is 250 MPH in accordance with Figure 304.2(1) of ICC 500, all Group E occupancies with an aggregate occupant load of 50 or more shall have a

storm shelter constructed in accordance with ICC 500. The shelter shall be capable of housing the total occupant load of the Group E occupancy.

Exceptions:

1. Group E day care facilities.
2. Group E occupancies accessory to places of religious worship.
3. Buildings meeting the requirements for shelter design in ICC 500.

SECTION 424 CHILDREN'S PLAY STRUCTURES

424.1 Children's play structures. Children's play structures installed inside all occupancies covered by this code that exceed 10 feet (3048 mm) in height and 150 square feet (14 m²) in area shall comply with Sections 424.2 through 424.5.

424.2 Materials. Children's play structures shall be constructed of noncombustible materials or of combustible materials that comply with the following:

1. *Fire-retardant-treated* wood complying with Section 2303.2.
2. Light-transmitting plastics complying with Section 2606.
3. Foam plastics (including the pipe foam used in soft-contained play equipment structures) having a maximum heat-release rate not greater than 100 kilowatts when tested in accordance with UL 1975 or when tested in accordance with NFPA 289, using the 20 kW ignition source.
4. Aluminum composite material (ACM) meeting the requirements of Class A *interior finish* in accordance with Chapter 8 when tested as an assembly in the maximum thickness intended for use.
5. Textiles and films complying with the fire propagation performance criteria contained in Test Method 1 or Test Method 2, as appropriate, of NFPA 701.
6. Plastic materials used to construct rigid components of soft-contained play equipment structures (such as tubes, windows, panels, junction boxes, pipes, slides and decks) exhibiting a peak rate of heat release not exceeding 400 kW/ m² when tested in accordance with ASTM E1354 at an incident heat flux of 50 kW/m² in the horizontal orientation at a thickness of 6 mm.
7. Ball pool balls, used in soft-contained play equipment structures, having a maximum heat-release rate not greater than 100 kilowatts when tested in accordance with UL 1975 or when tested in accordance with NFPA 289, using the 20 kW ignition source. The minimum specimen test size shall be 36 inches by 36 inches (914 mm by 914 mm) by an average of 21 inches (533 mm) deep, and the balls shall be held in a box constructed of galvanized steel poultry netting wire mesh.
8. Foam plastics shall be covered by a fabric, coating or film meeting the fire propagation performance criteria

contained in Test Method 1 or Test Method 2, as appropriate, of NFPA 701.

9. The floor covering placed under the children's play structure shall exhibit a Class I interior floor finish classification, as described in Section 804, when tested in accordance with NFPA 253.

424.3 Fire protection. Children's play structures shall be provided with the same level of *approved* fire suppression and detection devices required for other structures in the same occupancy.

424.4 Separation. Children's play structures shall have a horizontal separation from building walls, partitions and from elements of the *means of egress* of not less than 5 feet (1524 mm). Children's playground structures shall have a horizontal separation from other children's play structures of not less than 20 feet (6090 mm).

424.5 Area limits. Children's play structures shall be not greater than 300 square feet (28 m²) in area, unless a special investigation, acceptable to the building official, has demonstrated adequate fire safety.

SECTION 425 HYPERBARIC FACILITIES

425.1 Hyperbaric facilities. Hyperbaric facilities shall meet the requirements contained in Chapter 14 of NFPA 99.

SECTION 426 COMBUSTIBLE DUSTS, GRAIN PROCESSING AND STORAGE

426.1 Combustible dusts, grain processing and storage. The provisions of Sections 426.1.1 through 426.1.7 shall apply to buildings in which materials that produce combustible dusts are stored or handled. Buildings that store or handle combustible dusts shall comply with the applicable provisions of NFPA 61, NFPA 85, NFPA 120, NFPA 484, NFPA 654, NFPA 655 and NFPA 664 and the *Fire Code*.

426.1.1 Type of construction and height exceptions. Buildings shall be constructed in compliance with the height, number of stories and area limitations specified in Sections 504 and 506; except that where erected of Type I or II construction, the heights and areas of grain elevators and similar structures shall be unlimited, and where of Type IV construction, the maximum building height shall be 65 feet (19 812 mm) and except further that, in isolated areas, the maximum building height of Type IV structures shall be increased to 85 feet (25 908 mm).

426.1.2 Grinding rooms. Every room or space occupied for grinding or other operations that produce combustible dusts in such a manner that the room or space is classified as a Group H-2 occupancy shall be enclosed with fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 711, or both. The fire-resistance rating of the enclosure shall be not less than 2 hours where the area is not more than 3,000 square feet (279 m²), and not less than 4 hours where the area is greater than 3,000 square feet (279 m²).

426.1.3 Conveyors. Conveyors, chutes, piping and similar equipment passing through the enclosures of rooms or spaces shall be constructed dirt tight and vapor tight, and be of *approved* noncombustible materials complying with Chapter 30.

426.1.4 Explosion control. Explosion control shall be provided as specified in the *Fire Code*, or spaces shall be equipped with the equivalent mechanical *ventilation* complying with the *Mechanical Code*.

426.1.5 Grain elevators. Grain elevators, malt houses and buildings for similar occupancies shall not be located within 30 feet (9144 mm) of interior *lot lines* or structures on the same *lot*, except where erected along a railroad right-of-way.

426.1.6 Coal pockets. Coal pockets located less than 30 feet (9144 mm) from interior lot lines or from structures on the same lot shall be constructed of not less than Type IB construction. Where more than 30 feet (9144 mm) from interior *lot lines*, or where erected along a railroad right-of-way, the minimum type of construction of such structures not more than 65 feet (19 812 mm) in *building height* shall be Type IV.

426.1.7 Tire rebuilding. Buffing operations shall be located in a room separated from the remainder of the building housing the tire rebuilding or tire recapping operation by a 1-hour *fire barrier*.

Exception: Buffing operations are not required to be separated where all of the following conditions are met:

1. Buffing operations are equipped with an *approved* continuous automatic water-spray system directed at the point of cutting action;
2. Buffing machines are connected to particle-collecting systems providing a minimum air movement of 1,500 cubic feet per minute (cfm) (0.71 m³/s) in volume and 4,500 feet per minute (fpm) (23 m/s) in-line velocity; and
3. The collecting system shall discharge the rubber particles to an *approved* outdoor noncombustible or fire-resistant container, which is emptied at frequent intervals to prevent overflow.

CHAPTER 5

GENERAL BUILDING HEIGHTS AND AREAS

SECTION 501 GENERAL

501.1 Scope. The provisions of this chapter control the height and area of structures hereafter erected and *additions* to existing structures.

SECTION 502 DEFINITIONS

502.1 Definitions. The following terms are defined in Chapter 2:

AREA, BUILDING.

BASEMENT.

EQUIPMENT PLATFORM.

GRADE PLANE.

HEIGHT, BUILDING.

MEZZANINE.

SECTION 503 GENERAL BUILDING HEIGHT AND AREA LIMITATIONS

503.1 General. Unless otherwise specifically modified in Chapter 4 and this chapter, *building height*, number of stories and *building area* shall not exceed the limits specified in Sections 504 and 506 based on the type of construction as determined by Section 602 and the occupancies as determined by Section 302 except as modified hereafter. *Building height*, number of stories and *building area* provisions shall be applied independently. Each portion of a building separated by one or more *fire walls* complying with Section 706 shall be considered to be a separate building.

503.1.1 Special industrial occupancies. Buildings and structures designed to house special low-hazard industrial processes that require large areas and unusual *building heights* to accommodate craneways or special machinery and equipment, including, among others, rolling mills; structural metal fabrication shops and foundries; or collection and treatment of sewage and stormwater, or the production and distribution of electric, gas or steam power, shall be exempt from the *building height*, number of stories and *building area* limitations specified in Sections 504 and 506. Ordinary repairs of such buildings or structures shall include specifically engineered structural and mechanical components designed for removal and replacement in kind.

503.1.2 Buildings on same lot. Two or more buildings on the same lot shall be regulated as separate buildings or shall be considered as portions of one building where the *building height*, number of stories of each building and the aggregate *building area* of the buildings are within the limitations specified in Sections 504 and 506. The provisions of this code applicable to the aggregate building shall be applicable to each building.

503.1.3 Type I construction. Buildings of Type I construction permitted to be of unlimited tabular *building heights and areas* are not subject to the special requirements that allow unlimited area buildings in Section 507 or unlimited *building height* in Sections 503.1.1 and 504.3 or increased *building heights and areas* for other types of construction.

SECTION 504 BUILDING HEIGHT AND NUMBER OF STORIES

504.1 General. The height, in feet, and the number of stories of a building shall be determined based on the type of construction, occupancy classification and whether there is an *automatic sprinkler system* installed throughout the building.

Exception: The *building height* of one-story aircraft hangars, aircraft paint hangars and buildings used for the manufacturing of aircraft shall not be limited where the building is provided with an *automatic sprinkler system* or *automatic fire-extinguishing system* in accordance with Chapter 9 and is entirely surrounded by *public ways* or *yards* not less in width than one and one-half times the *building height*.

504.1.1 Unlimited area buildings. The height of unlimited area buildings shall be designed in accordance with Section 507.

504.1.2 Special provisions. The special provisions of Section 510 permit the use of special conditions that are exempt from, or modify, the specific requirements of this chapter regarding the allowable heights of buildings based on the occupancy classification and type of construction, provided the special condition complies with the provisions specified in Section 510.

504.2 Mixed occupancy. In a building containing mixed occupancies in accordance with Section 508, no individual occupancy shall exceed the height and number of story limits specified in this section for the applicable occupancies.

504.3 Height in feet. The maximum height, in feet, of a building shall not exceed the limits specified in Table 504.3.

Exception: Towers, spires, steeples and other roof structures shall be constructed of materials consistent with the required type of construction of the building except where other construction is permitted by Section 1510.2.5. Such structures shall not be used for habitation or storage. The structures shall be unlimited in height where of noncombustible materials and shall not extend more than 20 feet (6096 mm) above the allowable building height where of combustible materials (see Chapter 15 for additional requirements).

504.4 Number of stories. The maximum number of stories of a building shall not exceed the limits specified in Table 504.4.

SECTION 505 MEZZANINES AND EQUIPMENT PLATFORMS

505.1 General. *Mezzanines* shall comply with Section 505.2. *Equipment platforms* shall comply with Section 505.3.

505.2 Mezzanines. A *mezzanine* or *mezzanines* in compliance with Section 505.2 shall be considered a portion of the *story* below. Such *mezzanines* shall not contribute to either the *building area* or number of *stories* as regulated by Section 503.1. The area of the *mezzanine* shall be included in determining the *fire area*. The clear height above and below the *mezzanine* floor construction shall be not less than 7 feet (2134 mm).

505.2.1 Area limitation. The aggregate area of a *mezzanine* or *mezzanines* within a room shall be not greater than one-third of the floor area of that room or space in which they are located. The enclosed portion of a room shall not

TABLE 504.3^a
ALLOWABLE BUILDING HEIGHT IN FEET ABOVE GRADE PLANE

| OCCUPANCY CLASSIFICATION | TYPE OF CONSTRUCTION | | | | | | | | | |
|--------------------------|-----------------------|--------|-----|---------|----|----------|----|---------|--------|----|
| | SEE FOOTNOTES | TYPE I | | TYPE II | | TYPE III | | TYPE IV | TYPE V | |
| | | A | B | A | B | A | B | HT | A | B |
| A, B, E, F, M, S, U | NS ^b | UL | 160 | 65 | 55 | 65 | 55 | 65 | 50 | 40 |
| | S | UL | 180 | 85 | 75 | 85 | 75 | 85 | 70 | 60 |
| H-1, H-2, H-3, H-5 | NS ^{c, d} | UL | 160 | 65 | 55 | 65 | 55 | 65 | 50 | 40 |
| | S | | | | | | | | | |
| H-4 | NS ^{c, d} | UL | 160 | 65 | 55 | 65 | 55 | 65 | 50 | 40 |
| | S | UL | 180 | 85 | 75 | 85 | 75 | 85 | 70 | 60 |
| I-1 Condition 1, I-3 | NS ^{d, e} | UL | 160 | 65 | 55 | 65 | 55 | 65 | 50 | 40 |
| | S | UL | 180 | 85 | 75 | 85 | 75 | 85 | 70 | 60 |
| I-1 Condition 2, I-2 | NS ^{d, f, e} | UL | 160 | 65 | 55 | 65 | 55 | 65 | 50 | 40 |
| | S | UL | 180 | 85 | | | | | | |
| I-4 | NS ^{d, g} | UL | 160 | 65 | 55 | 65 | 55 | 65 | 50 | 40 |
| | S | UL | 180 | 85 | 75 | 85 | 75 | 85 | 70 | 60 |
| R | NS ^{d, h} | UL | 160 | 65 | 55 | 65 | 55 | 65 | 50 | 40 |
| | S13R | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| | S | UL | 180 | 85 | 75 | 85 | 75 | 85 | 70 | 60 |

For SI: 1 foot = 304.8 mm.

Note: UL = Unlimited; NS = Buildings not equipped throughout with an automatic sprinkler system; S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; S13R = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2.

- See Chapters 4 and 5 for specific exceptions to the allowable height in this chapter.
- See Section 903.2 for the minimum thresholds for protection by an automatic sprinkler system for specific occupancies.
- New Group H occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.5.
- The NS value is only for use in evaluation of existing building height in accordance with the *Existing Building Code*.
- New Group I-1 and I-3 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6. For new Group I-1 occupancies Condition 1, see Exception 1 of Section 903.2.6.
- New and existing Group I-2 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6 and Section 1103.5 of the *Fire Code*.
- For new Group I-4 occupancies, see Exceptions 2 and 3 of Section 903.2.6.
- New Group R occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.8.

TABLE 504.4^{a, b}
ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE

| OCCUPANCY CLASSIFICATION | TYPE OF CONSTRUCTION | | | | | | | | | |
|--------------------------|----------------------|--------|----|---------|----|----------|----|---------|--------|----|
| | SEE FOOTNOTES | TYPE I | | TYPE II | | TYPE III | | TYPE IV | TYPE V | |
| | | A | B | A | B | A | B | HT | A | B |
| A-1 | NS | UL | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 1 |
| | S | UL | 6 | 4 | 3 | 4 | 3 | 4 | 3 | 2 |
| A-2 | NS | UL | 11 | 3 | 2 | 3 | 2 | 3 | 2 | 1 |
| | S | UL | 13 | 4 | 3 | 4 | 3 | 4 | 3 | 2 |
| A-3 | NS | UL | 11 | 3 | 2 | 3 | 2 | 3 | 2 | 1 |
| | S | UL | 13 | 4 | 3 | 4 | 3 | 4 | 3 | 2 |
| A-4 | NS | UL | 11 | 3 | 2 | 3 | 2 | 3 | 2 | 1 |
| | S | UL | 12 | 4 | 3 | 4 | 3 | 4 | 3 | 2 |
| A-5 | NS | UL | UL | UL | UL | UL | UL | UL | UL | UL |
| | S | UL | UL | UL | UL | UL | UL | UL | UL | UL |
| B | NS | UL | 11 | 5 | 4 | 5 | 4 | 5 | 3 | 2 |
| | S | UL | 13 | 6 | 5 | 6 | 5 | 6 | 4 | 3 |
| E | NS | UL | 5 | 3 | 2 | 3 | 2 | 3 | 1 | 1 |
| | S | UL | 6 | 4 | 3 | 4 | 3 | 4 | 2 | 2 |
| F-1 | NS | UL | 11 | 4 | 2 | 3 | 2 | 4 | 2 | 1 |
| | S | UL | 12 | 5 | 3 | 4 | 3 | 5 | 3 | 2 |
| F-2 | NS | UL | 11 | 5 | 3 | 4 | 3 | 5 | 3 | 2 |
| | S | UL | 12 | 6 | 4 | 5 | 4 | 6 | 4 | 3 |
| H-1 | NS ^{c, d} | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | NP |
| | S | | | | | | | | | |
| H-2 | NS ^{c, d} | UL | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 1 |
| | S | | | | | | | | | |
| H-3 | NS ^{c, d} | UL | 6 | 4 | 2 | 4 | 2 | 4 | 2 | 1 |
| | S | | | | | | | | | |
| H-4 | NS ^{c, d} | UL | 7 | 5 | 3 | 5 | 3 | 5 | 3 | 2 |
| | S | UL | 8 | 6 | 4 | 6 | 4 | 6 | 4 | 3 |
| H-5 | NS ^{c, d} | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| | S | | | | | | | | | |
| I-1 Condition 1 | NS ^{d, e} | UL | 9 | 4 | 3 | 4 | 3 | 4 | 3 | 2 |
| | S | UL | 10 | 5 | 4 | 5 | 4 | 5 | 4 | 3 |
| I-1 Condition 2 | NS ^{d, e} | UL | 9 | 4 | 3 | 4 | 3 | 4 | 3 | 2 |
| | S | UL | 10 | 5 | | | | | | |
| I-2 | NS ^{d, f} | UL | 4 | 2 | 1 | 1 | NP | 1 | 1 | NP |
| | S | UL | 5 | 3 | | | | | | |
| I-3 | NS ^{d, e} | UL | 4 | 2 | 1 | 2 | 1 | 2 | 2 | 1 |
| | S | UL | 5 | 3 | 2 | 3 | 2 | 3 | 3 | 2 |
| I-4 | NS ^{d, g} | UL | 5 | 3 | 2 | 3 | 2 | 3 | 1 | 1 |
| | S | UL | 6 | 4 | 3 | 4 | 3 | 4 | 2 | 2 |
| M | NS | UL | 11 | 4 | 4 | 4 | 4 | 4 | 3 | 1 |
| | S | UL | 12 | 5 | 5 | 5 | 5 | 5 | 4 | 2 |

(continued)

TABLE 504.4^{a, b}—continued
ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE

| OCCUPANCY CLASSIFICATION | TYPE OF CONSTRUCTION | | | | | | | | | |
|--------------------------|----------------------|--------|----|---------|---|----------|---|---------|--------|---|
| | SEE FOOTNOTES | TYPE I | | TYPE II | | TYPE III | | TYPE IV | TYPE V | |
| | | A | B | A | B | A | B | HT | A | B |
| R-1 | NS ^{d, h} | UL | 11 | 4 | 4 | 4 | 4 | 4 | 3 | 2 |
| | S13R | 4 | 4 | | | | | | 4 | 3 |
| | S | UL | 13 | 5 | 5 | 5 | 5 | 5 | 4 | 3 |
| R-2 | NS ^{d, h} | UL | 11 | 4 | 4 | 4 | 4 | 4 | 3 | 2 |
| | S13R | 4 | 4 | 4 | | | | | 4 | 3 |
| | S | UL | 13 | 5 | 5 | 5 | 5 | 5 | 4 | 3 |
| R-3 | NS ^{d, h} | UL | 11 | 4 | 4 | 4 | 4 | 4 | 3 | 3 |
| | S13R | 4 | 4 | | | | | | 4 | 4 |
| | S | UL | 13 | 5 | 5 | 5 | 5 | 5 | 4 | 4 |
| R-4 | NS ^{d, h} | UL | 11 | 4 | 4 | 4 | 4 | 4 | 3 | 2 |
| | S13R | 4 | 4 | | | | | | 4 | 3 |
| | S | UL | 13 | 5 | 5 | 5 | 5 | 5 | 4 | 3 |
| S-1 | NS | UL | 11 | 4 | 3 | 3 | 3 | 4 | 3 | 1 |
| | S | UL | 12 | 5 | 4 | 4 | 4 | 5 | 4 | 2 |
| S-2 | NS | UL | 11 | 5 | 4 | 4 | 4 | 4 | 4 | 2 |
| | S | UL | 12 | 6 | 5 | 5 | 5 | 5 | 5 | 3 |
| U | NS | UL | 5 | 4 | 2 | 3 | 2 | 4 | 2 | 1 |
| | S | UL | 6 | 5 | 3 | 4 | 3 | 5 | 3 | 2 |

Note: UL = Unlimited; NP = Not Permitted; NS = Buildings not equipped throughout with an automatic sprinkler system; S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; S13R = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2.

- See Chapters 4 and 5 for specific exceptions to the allowable height in this chapter.
- See Section 903.2 for the minimum thresholds for protection by an automatic sprinkler system for specific occupancies.
- New Group H occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.5.
- The NS value is only for use in evaluation of existing building height in accordance with the *Existing Building Code*.
- New Group I-1 and I-3 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6. For new Group I-1 occupancies, Condition 1, see Exception 1 of Section 903.2.6.
- New and existing Group I-2 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6 and Section 1103.5 of the *Fire Code*.
- For new Group I-4 occupancies, see Exceptions 2 and 3 of Section 903.2.6.
- New Group R occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.8.

be included in a determination of the floor area of the room in which the *mezzanine* is located. In determining the allowable *mezzanine* area, the area of the *mezzanine* shall not be included in the floor area of the room.

Where a room contains both a *mezzanine* and an *equipment platform*, the aggregate area of the two raised floor levels shall be not greater than two-thirds of the floor area of that room or space in which they are located.

Exceptions:

- The aggregate area of *mezzanines* in buildings and structures of Type I or II construction for special industrial occupancies in accordance with Section 503.1.1 shall be not greater than two-thirds of the floor area of the room.
- The aggregate area of *mezzanines* in buildings and structures of Type I or II construction shall

be not greater than one-half of the floor area of the room in buildings and structures equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1 and an *approved emergency voice/alarm communication system* in accordance with Section 907.5.2.2.

505.2.2 Means of egress. The *means of egress* for *mezzanines* shall comply with the applicable provisions of Chapter 10.

505.2.3 Openness. A *mezzanine* shall be open and unobstructed to the room in which such *mezzanine* is located except for walls not more than 42 inches (1067 mm) in height, columns and posts.

Exceptions:

- Mezzanines* or portions thereof are not required to be open to the room in which the *mezzanines* are

located, provided that the *occupant load* of the aggregate area of the enclosed space is not greater than 10.

2. A *mezzanine* having two or more exits or access to exits is not required to be open to the room in which the *mezzanine* is located.
3. *Mezzanines* or portions thereof are not required to be open to the room in which the *mezzanines* are located, provided that the aggregate floor area of the enclosed space is not greater than 10 percent of the *mezzanine* area.
4. In industrial facilities, *mezzanines* used for control equipment are permitted to be glazed on all sides.
5. In occupancies other than Groups H and I, that are no more than two *stories* above *grade plane* and equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, a *mezzanine* having two or more *means of egress* shall not be required to be open to the room in which the *mezzanine* is located.

505.3 Equipment platforms. *Equipment platforms* in buildings shall not be considered as a portion of the floor below. Such *equipment platforms* shall not contribute to either the *building area* or the number of *stories* as regulated by Section 503.1. The area of the *equipment platform* shall not be included in determining the *fire area* in accordance with Section 903. *Equipment platforms* shall not be a part of any *mezzanine* and such platforms and the walkways, *stairways*, *alternating tread devices* and ladders providing access to an *equipment platform* shall not serve as a part of the *means of egress* from the building.

505.3.1 Area limitation. The aggregate area of all *equipment platforms* within a room shall be not greater than two-thirds of the area of the room in which they are located. Where an *equipment platform* is located in the same room as a *mezzanine*, the area of the *mezzanine* shall be determined by Section 505.2.1 and the combined aggregate area of the *equipment platforms* and *mezzanines* shall be not greater than two-thirds of the room in which they are located.

505.3.2 Automatic sprinkler system. Where located in a building that is required to be protected by an *automatic sprinkler system*, *equipment platforms* shall be fully protected by sprinklers above and below the platform, where required by the standards referenced in Section 903.3.

505.3.3 Guards. *Equipment platforms* shall have *guards* where required by Section 1015.2.

SECTION 506 BUILDING AREA

506.1 General. The floor area of a building shall be determined based on the type of construction, occupancy classification, whether there is an automatic sprinkler system installed throughout the building and the amount of building frontage on public way or open space.

506.1.1 Unlimited area buildings. Unlimited area buildings shall be designed in accordance with Section 507.

506.1.2 Special provisions. The special provisions of Section 510 permit the use of special conditions that are exempt from, or modify, the specific requirements of this chapter regarding the allowable areas of buildings based on the occupancy classification and type of construction, provided the special condition complies with the provisions specified in Section 510.

506.1.3 Basements. Basements need not be included in the total allowable floor area of a building provided the total area of such basements does not exceed the area permitted for a one-story above grade plane building.

506.2 Allowable area determination. The allowable area of a building shall be determined in accordance with the applicable provisions of Sections 506.2.1 through 506.2.4 and Section 506.3.

506.2.1 Single-occupancy, one-story buildings. The allowable area of a single-occupancy building with no more than one story above grade plane shall be determined in accordance with Equation 5-1:

$$A_a = A_t + (NS \times I_f) \quad \text{(Equation 5-1)}$$

where:

A_a = Allowable area (square feet).

A_t = Tabular allowable area factor (NS, S1, or S13R value, as applicable) in accordance with Table 506.2.

NS = Tabular allowable area factor in accordance with Table 506.2 for nonsprinklered building (regardless of whether the building is sprinklered).

I_f = Area factor increase due to frontage (percent) as calculated in accordance with Section 506.3.

506.2.2 Mixed-occupancy, one-story buildings. The allowable area of a mixed-occupancy building with no more than one story above grade plane shall be determined in accordance with the applicable provisions of Section 508.1 based on Equation 5-1 for each applicable occupancy.

506.2.2.1 Group H-2 or H-3 mixed occupancies. For a building containing Group H-2 or H-3 occupancies, the allowable area shall be determined in accordance with Section 508.4.2, with the sprinkler system increase applicable only to the portions of the building not classified as Group H-2 or H-3.

TABLE 506.2^{a, b}
ALLOWABLE AREA FACTOR (A_f = NS, S1, S13R, or SM, as applicable) IN SQUARE FEET

| OCCUPANCY CLASSIFICATION | SEE FOOTNOTES | TYPE OF CONSTRUCTION | | | | | | | | |
|--------------------------|--------------------|----------------------|--------|---------|--------|----------|--------|---------|--------|--------|
| | | TYPE I | | TYPE II | | TYPE III | | TYPE IV | TYPE V | |
| | | A | B | A | B | A | B | HT | A | B |
| A-1 | NS | UL | UL | 15,500 | 8,500 | 14,000 | 8,500 | 15,000 | 11,500 | 5,500 |
| | S1 | UL | UL | 62,000 | 34,000 | 56,000 | 34,000 | 60,000 | 46,000 | 22,000 |
| | SM | UL | UL | 46,500 | 25,500 | 42,000 | 25,500 | 45,000 | 34,500 | 16,500 |
| A-2 | NS | UL | UL | 15,500 | 9,500 | 14,000 | 9,500 | 15,000 | 11,500 | 6,000 |
| | S1 | UL | UL | 62,000 | 38,000 | 56,000 | 38,000 | 60,000 | 46,000 | 24,000 |
| | SM | UL | UL | 46,500 | 28,500 | 42,000 | 28,500 | 45,000 | 34,500 | 18,000 |
| A-3 | NS | UL | UL | 15,500 | 9,500 | 14,000 | 9,500 | 15,000 | 11,500 | 6,000 |
| | S1 | UL | UL | 62,000 | 38,000 | 56,000 | 38,000 | 60,000 | 46,000 | 24,000 |
| | SM | UL | UL | 46,500 | 28,500 | 42,000 | 28,500 | 45,000 | 34,500 | 18,000 |
| A-4 | NS | UL | UL | 15,500 | 9,500 | 14,000 | 9,500 | 15,000 | 11,500 | 6,000 |
| | S1 | UL | UL | 62,000 | 38,000 | 56,000 | 38,000 | 60,000 | 46,000 | 24,000 |
| | SM | UL | UL | 46,500 | 28,500 | 42,000 | 28,500 | 45,000 | 34,500 | 18,000 |
| A-5 | NS | UL | UL | UL | UL | UL | UL | UL | UL | UL |
| | S1 | | | | | | | | | |
| | SM | | | | | | | | | |
| B | NS | UL | UL | 37,500 | 23,000 | 28,500 | 19,000 | 36,000 | 18,000 | 9,000 |
| | S1 | UL | UL | 150,000 | 92,000 | 114,000 | 76,000 | 144,000 | 72,000 | 36,000 |
| | SM | UL | UL | 112,500 | 69,000 | 85,500 | 57,000 | 108,000 | 54,000 | 27,000 |
| E | NS | UL | UL | 26,500 | 14,500 | 23,500 | 14,500 | 25,500 | 18,500 | 9,500 |
| | S1 | UL | UL | 106,000 | 58,000 | 94,000 | 58,000 | 102,000 | 74,000 | 38,000 |
| | SM | UL | UL | 79,500 | 43,500 | 70,500 | 43,500 | 76,500 | 55,500 | 28,500 |
| F-1 | NS | UL | UL | 25,000 | 15,500 | 19,000 | 12,000 | 33,500 | 14,000 | 8,500 |
| | S1 | UL | UL | 100,000 | 62,000 | 76,000 | 48,000 | 134,000 | 56,000 | 34,000 |
| | SM | UL | UL | 75,000 | 46,500 | 57,000 | 36,000 | 100,500 | 42,000 | 25,500 |
| F-2 | NS | UL | UL | 37,500 | 23,000 | 28,500 | 18,000 | 50,500 | 21,000 | 13,000 |
| | S1 | UL | UL | 150,000 | 92,000 | 114,000 | 72,000 | 202,000 | 84,000 | 52,000 |
| | SM | UL | UL | 112,500 | 69,000 | 85,500 | 54,000 | 151,500 | 63,000 | 39,000 |
| H-1 | NS ^c | 21,000 | 16,500 | 11,000 | 7,000 | 9,500 | 7,000 | 10,500 | 7,500 | NP |
| | S1 | | | | | | | | | |
| H-2 | NS ^c | 21,000 | 16,500 | 11,000 | 7,000 | 9,500 | 7,000 | 10,500 | 7,500 | 3,000 |
| | S1 | | | | | | | | | |
| | SM | | | | | | | | | |
| H-3 | NS ^c | UL | 60,000 | 26,500 | 14,000 | 17,500 | 13,000 | 25,500 | 10,000 | 5,000 |
| | S1 | | | | | | | | | |
| | SM | | | | | | | | | |
| H-4 | NS ^{c, d} | UL | UL | 37,500 | 17,500 | 28,500 | 17,500 | 36,000 | 18,000 | 6,500 |
| | S1 | UL | UL | 150,000 | 70,000 | 114,000 | 70,000 | 144,000 | 72,000 | 26,000 |
| | SM | UL | UL | 112,500 | 52,500 | 85,500 | 52,500 | 108,000 | 54,000 | 19,500 |
| H-5 | NS ^{c, d} | UL | UL | 37,500 | 23,000 | 28,500 | 19,000 | 36,000 | 18,000 | 9,000 |
| | S1 | UL | UL | 150,000 | 92,000 | 114,000 | 76,000 | 144,000 | 72,000 | 36,000 |
| | SM | UL | UL | 112,500 | 69,000 | 85,500 | 57,000 | 108,000 | 54,000 | 27,000 |

(continued)

TABLE 506.2^{a, b}—continued
ALLOWABLE AREA FACTOR (A_f = NS, S1, S13R, or SM, as applicable) IN SQUARE FEET

| OCCUPANCY CLASSIFICATION | SEE FOOTNOTES | TYPE OF CONSTRUCTION | | | | | | | | |
|--------------------------|--------------------|----------------------|---------|---------|---------|----------|---------|---------|--------|--------|
| | | TYPE I | | TYPE II | | TYPE III | | TYPE IV | TYPE V | |
| | | A | B | A | B | A | B | HT | A | B |
| I-1 | NS ^{d, c} | UL | 55,000 | 19,000 | 10,000 | 16,500 | 10,000 | 18,000 | 10,500 | 4,500 |
| | S1 | UL | 220,000 | 76,000 | 40,000 | 66,000 | 40,000 | 72,000 | 42,000 | 18,000 |
| | SM | UL | 165,000 | 57,000 | 30,000 | 49,500 | 30,000 | 54,000 | 31,500 | 13,500 |
| I-2 | NS ^{d, f} | UL | UL | 15,000 | 11,000 | 12,000 | NP | 12,000 | 9,500 | NP |
| | S1 | UL | UL | 60,000 | 44,000 | 48,000 | NP | 48,000 | 38,000 | NP |
| | SM | UL | UL | 45,000 | 33,000 | 36,000 | NP | 36,000 | 28,500 | NP |
| I-3 | NS ^{d, c} | UL | UL | 15,000 | 10,000 | 10,500 | 7,500 | 12,000 | 7,500 | 5,000 |
| | S1 | UL | UL | 45,000 | 40,000 | 42,000 | 30,000 | 48,000 | 30,000 | 20,000 |
| | SM | UL | UL | 45,000 | 30,000 | 31,500 | 22,500 | 36,000 | 22,500 | 15,000 |
| I-4 | NS ^{d, g} | UL | 60,500 | 26,500 | 13,000 | 23,500 | 13,000 | 25,500 | 18,500 | 9,000 |
| | S1 | UL | 121,000 | 106,000 | 52,000 | 94,000 | 52,000 | 102,000 | 74,000 | 36,000 |
| | SM | UL | 181,500 | 79,500 | 39,000 | 70,500 | 39,000 | 76,500 | 55,500 | 27,000 |
| M | NS | UL | UL | 21,500 | 12,500 | 18,500 | 12,500 | 20,500 | 14,000 | 9,000 |
| | S1 | UL | UL | 86,000 | 50,000 | 74,000 | 50,000 | 82,000 | 56,000 | 36,000 |
| | SM | UL | UL | 64,500 | 37,500 | 55,500 | 37,500 | 61,500 | 42,000 | 27,000 |
| R-1 | NS ^{d, h} | UL | UL | 24,000 | 16,000 | 24,000 | 16,000 | 20,500 | 12,000 | 7,000 |
| | S13R | | | | | | | | | |
| | S1 | UL | UL | 96,000 | 64,000 | 96,000 | 64,000 | 82,000 | 48,000 | 28,000 |
| | SM | UL | UL | 72,000 | 48,000 | 72,000 | 48,000 | 61,500 | 36,000 | 21,000 |
| R-2 | NS ^{d, h} | UL | UL | 24,000 | 16,000 | 24,000 | 16,000 | 20,500 | 12,000 | 7,000 |
| | S13R | | | | | | | | | |
| | S1 | UL | UL | 96,000 | 64,000 | 96,000 | 64,000 | 82,000 | 48,000 | 28,000 |
| | SM | UL | UL | 72,000 | 48,000 | 72,000 | 48,000 | 61,500 | 36,000 | 21,000 |
| R-3 | NS ^{d, h} | UL | UL | UL | UL | UL | UL | UL | UL | UL |
| | S13R | | | | | | | | | |
| | S1 | | | | | | | | | |
| | SM | | | | | | | | | |
| R-4 | NS ^{d, h} | UL | UL | 24,000 | 16,000 | 24,000 | 16,000 | 20,500 | 12,000 | 7,000 |
| | S13R | | | | | | | | | |
| | S1 | UL | UL | 96,000 | 64,000 | 96,000 | 64,000 | 82,000 | 48,000 | 28,000 |
| | SM | UL | UL | 72,000 | 48,000 | 72,000 | 48,000 | 61,500 | 36,000 | 21,000 |
| S-1 | NS | UL | 48,000 | 26,000 | 17,500 | 26,000 | 17,500 | 25,500 | 14,000 | 9,000 |
| | S1 | UL | 192,000 | 104,000 | 70,000 | 104,000 | 70,000 | 102,000 | 56,000 | 36,000 |
| | SM | UL | 144,000 | 78,000 | 52,500 | 78,000 | 52,500 | 76,500 | 42,000 | 27,000 |
| S-2 | NS | UL | 79,000 | 39,000 | 26,000 | 39,000 | 26,000 | 38,500 | 21,000 | 13,500 |
| | S1 | UL | 316,000 | 156,000 | 104,000 | 156,000 | 104,000 | 154,000 | 84,000 | 54,000 |
| | SM | UL | 237,000 | 117,000 | 78,000 | 117,000 | 78,000 | 115,500 | 63,000 | 40,500 |
| U | NS | UL | 35,500 | 19,000 | 8,500 | 14,000 | 8,500 | 18,000 | 9,000 | 5,500 |
| | S1 | UL | 142,000 | 76,000 | 34,000 | 56,000 | 34,000 | 72,000 | 36,000 | 22,000 |
| | SM | UL | 106,500 | 57,000 | 25,500 | 42,000 | 25,500 | 54,000 | 27,000 | 16,500 |

(continued)

TABLE 506.2^{a,b}—continued
ALLOWABLE AREA FACTOR (A_t = NS, S1, S13R, or SM, as applicable) IN SQUARE FEET

Note: UL = Unlimited; NP = Not permitted;

For SI: 1 square foot = 0.0929 m².

NS = Buildings not equipped throughout with an automatic sprinkler system; S1 = Buildings a maximum of one story above grade plane equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; SM = Buildings two or more stories above grade plane equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; S13R = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2.

- a. See Chapters 4 and 5 for specific exceptions to the allowable height in this chapter.
- b. See Section 903.2 for the minimum thresholds for protection by an automatic sprinkler system for specific occupancies.
- c. New Group H occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.5.
- d. The NS value is only for use in evaluation of existing building area in accordance with the *Existing Building Code*.
- e. New Group I-1 and I-3 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6. For new Group I-1 occupancies, Condition 1, see Exception 1 of Section 903.2.6.
- f. New and existing Group I-2 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6 and Section 1103.5 of the *Fire Code*.
- g. New Group I-4 occupancies see Exceptions 2 and 3 of Section 903.2.6.
- h. New Group R occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.8.

506.2.3 Single-occupancy, multistory buildings. The allowable area of a single-occupancy building with more than one story above grade plane shall be determined in accordance with Equation 5-2:

$$A_a = [A_t + (NS \times I_f)] \times S_a \quad \text{(Equation 5-2)}$$

where:

A_a = Allowable area (square feet).

A_t = Tabular allowable area factor (NS, S13R or SM value, as applicable) in accordance with Table 506.2.

NS = Tabular allowable area factor in accordance with Table 506.2 for a nonsprinklered building (regardless of whether the building is sprinklered).

I_f = Area factor increase due to frontage (percent) as calculated in accordance with Section 506.3.

S_a = Actual number of building stories above grade plane, not to exceed three. For buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2, use the actual number of building stories above grade plane, not to exceed four.

No individual story shall exceed the allowable area (A_a) as determined by Equation 5-2 using the value of $S_a = 1$.

506.2.4 Mixed-occupancy, multistory buildings. Each story of a mixed-occupancy building with more than one story above grade plane shall individually comply with the applicable requirements of Section 508.1. For buildings with more than three stories above grade plane, the total building area shall be such that the aggregate sum of the ratios of the actual area of each story divided by the allowable area of such stories, determined in accordance with Equation 5-3 based on the applicable provisions of Section 508.1, shall not exceed three.

$$A_a = [A_t + (NS \times I_f)] \quad \text{(Equation 5-3)}$$

where:

A_a = Allowable area (square feet).

A_t = Tabular allowable area factor (NS, S13R or SM value, as applicable) in accordance with Table 506.2.

NS = Tabular allowable area factor in accordance with Table 506.2 for a nonsprinklered building (regardless of whether the building is sprinklered).

I_f = Area factor increase due to frontage (percent) as calculated in accordance with Section 506.3.

Exception: For buildings designed as separated occupancies under Section 508.4 and equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.2, the total building area shall be such that the aggregate sum of the ratios of the actual area of each story divided by the allowable area of such stories determined in accordance with Equation 5-3 based on the applicable provisions of Section 508.1, shall not exceed four.

506.2.4.1 Group H-2 or H-3 mixed occupancies. For a building containing Group H-2 or H-3 occupancies, the allowable area shall be determined in accordance with Section 508.4.2, with the sprinkler system increase applicable only to the portions of the building not classified as Group H-2 or H-3.

506.3 Frontage increase. Every building shall adjoin or have access to a public way to receive an area factor increase based on frontage. Area factor increase shall be determined in accordance with Sections 506.3.1 through 506.3.3.

506.3.1 Minimum percentage of perimeter. To qualify for an area factor increase based on frontage, a building shall have not less than 25 percent of its perimeter on a public way or open space. Such open space shall be either on the same lot or dedicated for public use and shall be accessed from a street or approved fire lane.

506.3.2 Minimum frontage distance. To qualify for an area factor increase based on frontage, the public way or open space adjacent to the building perimeter shall have a minimum distance (W) of 20 feet (6096 mm) measured at right angles from the building face to any of the following:

1. The closest interior lot line.
2. The entire width of a street, alley or public way.

3. The exterior face of an adjacent building on the same property.

Where the value of W is greater than 30 feet (9144 mm), a value of 30 feet (9144 mm) shall be used in calculating the building area increase based on frontage, regardless of the actual width of the public way or open space. Where the value of W varies along the perimeter of the building, the calculation performed in accordance with Equation 5-5 shall be based on the weighted average calculated in accordance with Equation 5-4.

$$W = (L_1 \times w_1 + L_2 \times w_2 + L_3 \times w_3 \dots) / F \quad (\text{Equation 5-4})$$

where:

W (Width: weighted average) = Calculated width of public way or open space (feet).

L_n = Length of a portion of the exterior perimeter wall.

w_n = Width (≥ 20 feet) of a public way or open space associated with that portion of the exterior perimeter wall.

F = Building perimeter that fronts on a public way or open space having a width of 20 feet (6096 mm) or more.

Exception: Where a building meets the requirements of Section 507, as applicable, except for compliance with the minimum 60-foot (18 288 mm) *public way* or *yard* requirement, and the value of W is greater than 30 feet (9144 mm), the value of W shall not exceed 60 feet (18 288 mm).

506.3.3 Amount of increase. The area factor increase based on frontage shall be determined in accordance with Equation 5-5:

$$I_f = [F/P - 0.25]W/30 \quad (\text{Equation 5-5})$$

where:

I_f = Area factor increase due to frontage.

F = Building perimeter that fronts on a *public way* or open space having minimum distance of 20 feet (6096 mm).

P = Perimeter of entire building (feet).

W = Width of *public way* or open space (feet) in accordance with Section 506.3.2.

SECTION 507 UNLIMITED AREA BUILDINGS

507.1 General. The area of buildings of the occupancies and configurations specified in Sections 507.1 through 507.12 shall not be limited. Basements not more than one story below grade plane shall be permitted.

507.1.1 Accessory occupancies. Accessory occupancies shall be permitted in unlimited area buildings in accordance with the provisions of Section 508.2, otherwise the requirements of Sections 507.3 through 507.13 shall be applied, where applicable.

507.2 Measurement of open spaces. Where Sections 507.3 through 507.13 require buildings to be surrounded and adjoined by *public ways* and *yards*, those open spaces shall be determined as follows:

1. Yards shall be measured from the building perimeter in all directions to the closest interior *lot lines* or to the exterior face of an opposing building located on the same *lot*, as applicable.
2. Where the building fronts on a *public way*, the entire width of the *public way* shall be used.

507.2.1 Reduced open space. The *public ways* or *yards* of 60 feet (18 288 mm) in width required in Sections 507.3, 507.4, 507.5, 507.6 and 507.12 shall be permitted to be reduced to not less than 40 feet (12 192 mm) in width provided all of the following requirements are met:

1. The reduced width shall not be allowed for more than 75 percent of the perimeter of the building.
2. The *exterior walls* facing the reduced width shall have a *fire-resistance rating* of not less than 3 hours.
3. Openings in the *exterior walls* facing the reduced width shall have opening protectives with a *fire protection rating* of not less than 3 hours.

507.3 Nonsprinklered, one-story buildings. The area of a Group F-2 or S-2 building no more than one story in height shall not be limited where the building is surrounded and adjoined by *public ways* or *yards* not less than 60 feet (18 288 mm) in width.

507.4 Sprinklered, one-story buildings. The area of a Group A-4 building no more than one story above grade plane of other than Type V construction, or the area of a Group B, F, M or S building no more than one story above grade plane of any construction type, shall not be limited where the building is provided with an *automatic sprinkler system* throughout in accordance with Section 903.3.1.1 and is surrounded and adjoined by *public ways* or *yards* not less than 60 feet (18 288 mm) in width.

Exceptions:

1. Buildings and structures of Type I or II construction for rack storage facilities that do not have access by the public shall not be limited in height, provided that such buildings conform to the requirements of Sections 507.4 and 903.3.1.1 and Chapter 32 of the *Fire Code*.
2. The *automatic sprinkler system* shall not be required in areas occupied for indoor participant sports, such as tennis, skating, swimming and equestrian activities in occupancies in Group A-4, provided that both of the following criteria are met:
 - 2.1. *Exit* doors directly to the outside are provided for occupants of the participant sports areas.
 - 2.2. The building is equipped with a *fire alarm system* with *manual fire alarm boxes* installed in accordance with Section 907.

507.4.1 Mixed occupancy buildings with Groups A-1 and A-2. Group A-1 and A-2 occupancies of other than Type V construction shall be permitted within mixed occupancy buildings of unlimited area complying with Section 507.4, provided all of the following criteria are met:

1. Group A-1 and A-2 occupancies are separated from other occupancies as required for separated occupancies in Section 508.4.4 with no reduction allowed in the *fire-resistance rating* of the separation based upon the installation of an *automatic sprinkler system*.
2. Each area of the portions of the building used for Group A-1 or A-2 occupancies shall not exceed the maximum allowable area permitted for such occupancies in Section 503.1.
3. *Exit* doors from Group A-1 and A-2 occupancies shall discharge directly to the exterior of the building.

507.5 Two-story buildings. The area of a Group B, F, M or S building no more than two *stories above grade plane* shall not be limited where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 and is surrounded and adjoined by *public ways or yards* not less than 60 feet (18 288 mm) in width.

507.6 Group A-3 buildings of Type II construction. The area of a Group A-3 building no more than one *story above grade plane*, used as a *place of religious worship*, community hall, dance hall, exhibition hall, gymnasium, lecture hall, indoor *swimming pool* or tennis court of Type II construction, shall not be limited provided all of the following criteria are met:

1. The building shall not have a *stage* other than a *platform*.
2. The building shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
3. The building shall be surrounded and adjoined by *public ways or yards* not less than 60 feet (18 288 mm) in width.

507.7 Group A-3 buildings of Type III and IV construction. The area of a Group A-3 building of Type III or IV construction, with no more than one *story above grade plane* and used as a *place of religious worship*, community hall, dance hall, exhibition hall, gymnasium, lecture hall, indoor *swimming pool* or tennis court, shall not be limited provided all of the following criteria are met:

1. The building shall not have a *stage* other than a *platform*.
2. The building shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
3. The assembly floor shall be located at or within 21 inches (533 mm) of street or grade level and all *exits*

are provided with ramps complying with Section 1012 to the street or grade level.

4. The building shall be surrounded and adjoined by *public ways or yards* not less than 60 feet (18 288 mm) in width.

507.8 Group H-2, H-3 and H-4 occupancies. Group H-2, H-3 and H-4 occupancies shall be permitted in unlimited area buildings containing Group F or S occupancies in accordance with Sections 507.4 and 507.5 and the provisions of Sections 507.8.1 through 507.8.4.

507.8.1 Allowable area. The aggregate floor area of Group H occupancies located in an unlimited area building shall not exceed 10 percent of the area of the building or the area limitations for the Group H occupancies as specified in Section 506 based on the perimeter of each Group H floor area that fronts on a *public way* or open space.

507.8.1.1 Located within the building. The aggregate floor area of Group H occupancies not located at the perimeter of the building shall not exceed 25 percent of the area limitations for the Group H occupancies as specified in Section 506.

507.8.1.1.1 Liquid use, dispensing and mixing rooms. Liquid use, dispensing and mixing rooms having a floor area of not more than 500 square feet (46.5 m²) need not be located on the outer perimeter of the building where they are in accordance with the *Fire Code* and NFPA 30.

507.8.1.1.2 Liquid storage rooms. Liquid storage rooms having a floor area of not more than 1,000 square feet (93 m²) need not be located on the outer perimeter where they are in accordance with the *Fire Code* and NFPA 30.

507.8.1.1.3 Spray paint booths. Spray paint booths that comply with the *Fire Code* need not be located on the outer perimeter.

507.8.2 Located on building perimeter. Except as provided for in Section 507.8.1.1, Group H occupancies shall be located on the perimeter of the building. In Group H-2 and H-3 occupancies, not less than 25 percent of the perimeter of such occupancies shall be an *exterior wall*.

507.8.3 Occupancy separations. Group H occupancies shall be separated from the remainder of the unlimited area building and from each other in accordance with Table 508.4.

507.8.4 Height limitations. For two-story, unlimited area buildings, Group H occupancies shall not be located more than one *story above grade plane* unless permitted based on the allowable height and number of *stories* and feet as specified in Section 504 based on the type of construction of the unlimited area building.

507.9 Unlimited mixed occupancy buildings with Group H-5. The area of a Group B, F, H-5, M or S building no more than two *stories above grade plane* shall not be limited where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, and is sur-

rounded and adjoined by *public ways* or *yards* not less than 60 feet (18 288 mm) in width, provided all of the following criteria are met:

1. Buildings containing Group H-5 occupancy shall be of Type I or II construction.
2. Each area used for Group H-5 occupancy shall be separated from other occupancies as required in Sections 415.11 and 508.4.
3. Each area used for Group H-5 occupancy shall not exceed the maximum allowable area permitted for such occupancies in Section 503.1 including modifications of Section 506.

Exception: Where the Group H-5 occupancy exceeds the maximum allowable area, the Group H-5 shall be subdivided into areas that are separated by 2-hour fire barriers.

507.10 Aircraft paint hangar. The area of a Group H-2 aircraft paint hangar no more than one *story above grade plane* shall not be limited where such aircraft paint hangar complies with the provisions of Section 412.6 and is surrounded and adjoined by *public ways* or *yards* not less in width than one and one-half times the *building height*.

507.11 Group E buildings. The area of a Group E building no more than one *story above grade plane*, of Type II, IIIA or IV construction, shall not be limited provided all of the following criteria are met:

1. Each classroom shall have not less than two *means of egress*, with one of the *means of egress* being a direct *exit* to the outside of the building complying with Section 1022.
2. The building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
3. The building is surrounded and adjoined by *public ways* or *yards* not less than 60 feet (18 288 mm) in width.

507.12 Motion picture theaters. In buildings of Type II construction, the area of a motion picture theater located on the first *story above grade plane* shall not be limited where the building is provided with an *automatic sprinkler system* throughout in accordance with Section 903.3.1.1 and is surrounded and adjoined by *public ways* or *yards* not less than 60 feet (18 288 mm) in width.

507.13 Covered and open mall buildings and anchor buildings. The area of *covered and open mall buildings* and *anchor buildings* not exceeding three *stories* in height that comply with Section 402 shall not be limited.

SECTION 508 MIXED USE AND OCCUPANCY

508.1 General. Each portion of a building shall be individually classified in accordance with Section 302.1. Where a building contains more than one occupancy group, the building or portion thereof shall comply with the applicable provisions of Section 508.2, 508.3 or 508.4, or a combination of these sections.

Exceptions:

1. Occupancies separated in accordance with Section 510.
2. Where required by Table 415.6.2, areas of Group H-1, H-2 and H-3 occupancies shall be located in a *detached building* or structure.
3. Uses within *live/work units*, complying with Section 419, are not considered separate occupancies.

508.2 Accessory occupancies. Accessory occupancies are those occupancies that are ancillary to the main occupancy of the building or portion thereof. Accessory occupancies shall comply with the provisions of Sections 508.2.1 through 508.2.4.

508.2.1 Occupancy classification. Accessory occupancies shall be individually classified in accordance with Section 302.1. The requirements of this code shall apply to each portion of the building based on the occupancy classification of that space.

508.2.2 Allowable building height. The allowable height and number of stories of the building containing accessory occupancies shall be in accordance with Section 504 for the main occupancy of the building.

508.2.3 Allowable building area. The allowable area of the building shall be based on the applicable provisions of Section 506 for the main occupancy of the building. Aggregate accessory occupancies shall not occupy more than 10 percent of the floor area of the story in which they are located and shall not exceed the tabular values for non-sprinklered buildings in Table 506.2 for each such accessory occupancy.

508.2.4 Separation of occupancies. No separation is required between accessory occupancies and the main occupancy.

Exceptions:

1. Group H-2, H-3, H-4 and H-5 occupancies shall be separated from all other occupancies in accordance with Section 508.4.
2. Group I-1, R-1, R-2 and R-3 *dwelling units* and *sleeping units* shall be separated from other *dwelling* or *sleeping units* and from accessory occupancies contiguous to them in accordance with the requirements of Section 420.

508.3 Nonseparated occupancies. Buildings or portions of buildings that comply with the provisions of this section shall be considered as nonseparated occupancies.

508.3.1 Occupancy classification. Nonseparated occupancies shall be individually classified in accordance with Section 302.1. The requirements of this code shall apply to each portion of the building based on the occupancy classification of that space. In addition, the most restrictive provisions of Chapter 9 that apply to the nonseparated occupancies shall apply to the total nonseparated occupancy.

GENERAL BUILDING HEIGHTS AND AREAS

pancy area. Where nonseparated occupancies occur in a *high-rise building*, the most restrictive requirements of Section 403 that apply to the nonseparated occupancies shall apply throughout the *high-rise building*.

508.3.2 Allowable building area and height. The allowable *building area and height* of the building or portion thereof shall be based on the most restrictive allowances for the occupancy groups under consideration for the type of construction of the building in accordance with Section 503.1.

508.3.3 Separation. No separation is required between nonseparated occupancies.

Exceptions:

1. Group H-2, H-3, H-4 and H-5 occupancies shall be separated from all other occupancies in accordance with Section 508.4.
2. Group I-1, R-1, R-2 and R-3 *dwelling units* and *sleeping units* shall be separated from other *dwelling* or *sleeping units* and from other occupancies contiguous to them in accordance with the requirements of Section 420.

508.4 Separated occupancies. Buildings or portions of buildings that comply with the provisions of this section shall be considered as separated occupancies.

508.4.1 Occupancy classification. Separated occupancies shall be individually classified in accordance with Section 302.1. Each separated space shall comply with this code

based on the occupancy classification of that portion of the building.

508.4.2 Allowable building area. In each *story*, the *building area* shall be such that the sum of the ratios of the actual *building area* of each separated occupancy divided by the allowable *building area* of each separated occupancy shall not exceed 1.

508.4.3 Allowable height. Each separated occupancy shall comply with the *building height* limitations based on the type of construction of the building in accordance with Section 503.1.

Exception: Special provisions of Section 510 shall permit occupancies at *building heights* other than provided in Section 503.1.

508.4.4 Separation. Individual occupancies shall be separated from adjacent occupancies in accordance with Table 508.4.

508.4.4.1 Construction. Required separations shall be *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both, so as to completely separate adjacent occupancies.

SECTION 509 INCIDENTAL USES

509.1 General. Incidental uses located within single occupancy or mixed occupancy buildings shall comply with the provisions of this section. Incidental uses are ancillary func-

**TABLE 508.4
REQUIRED SEPARATION OF OCCUPANCIES (HOURS)**

| OCCUPANCY | A, E | | I-1 ^a , I-3, I-4 | | I-2 | | R ^a | | F-2, S-2 ^b , U | | B ^c , F-1, M, S-1 | | H-1 | | H-2 | | H-3, H-4 | | H-5 | |
|------------------------------|------|----|-----------------------------|----|-----|----|----------------|----|---------------------------|----------------|------------------------------|----|-----|----|-----|----|----------------|----|-----|----|
| | S | NS | S | NS | S | NS | S | NS | S | NS | S | NS | S | NS | S | NS | S | NS | S | NS |
| A, E | N | N | 1 | 2 | 2 | NP | 1 | 2 | N | 1 | 1 | 2 | NP | NP | 3 | 4 | 2 | 3 | 2 | NP |
| I-1 ^a , I-3, I-4 | — | — | N | N | 2 | NP | 1 | NP | 1 | 2 | 1 | 2 | NP | NP | 3 | NP | 2 | NP | 2 | NP |
| I-2 | — | — | — | — | N | N | 2 | NP | 2 | NP | 2 | NP | NP | NP | 3 | NP | 2 | NP | 2 | NP |
| R ^a | — | — | — | — | — | — | N | N | 1 ^c | 2 ^c | 1 | 2 | NP | NP | 3 | NP | 2 | NP | 2 | NP |
| F-2, S-2 ^b , U | — | — | — | — | — | — | — | — | N | N | 1 | 2 | NP | NP | 3 | 4 | 2 | 3 | 2 | NP |
| B ^c , F-1, M, S-1 | — | — | — | — | — | — | — | — | — | — | N | N | NP | NP | 2 | 3 | 1 | 2 | 1 | NP |
| H-1 | — | — | — | — | — | — | — | — | — | — | — | — | N | NP | NP | NP | NP | NP | NP | NP |
| H-2 | — | — | — | — | — | — | — | — | — | — | — | — | — | N | NP | 1 | NP | 1 | NP | NP |
| H-3, H-4 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 1 ^d | NP | 1 | NP |
| H-5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | N | NP |

S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

NS = Buildings not equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

N = No separation requirement.

NP = Not permitted.

a. See Section 420.

b. The required separation from areas used only for private or pleasure vehicles shall be reduced by 1 hour but not to less than 1 hour.

c. See Section 406.3.4.

d. Separation is not required between occupancies of the same classification.

e. See Section 422.2 for ambulatory care facilities.

tions associated with a given occupancy that generally pose a greater level of risk to that occupancy and are limited to those uses listed in Table 509.

Exception: Incidental uses within and serving a *dwelling unit* are not required to comply with this section.

509.2 Occupancy classification. Incidental uses shall not be individually classified in accordance with Section 302.1. Incidental uses shall be included in the building occupancies within which they are located.

509.3 Area limitations. Incidental uses shall not occupy more than 10 percent of the *building area* of the *story* in which they are located.

509.4 Separation and protection. The incidental uses listed in Table 509 shall be separated from the remainder of the building or equipped with an *automatic sprinkler system*, or both, in accordance with the provisions of that table.

509.4.1 Separation. Where Table 509 specifies a fire-resistance-rated separation, the incidental uses shall be

separated from the remainder of the *building* by a *fire barrier* constructed in accordance with Section 707 or a *horizontal assembly* constructed in accordance with Section 711, or both. Construction supporting 1-hour *fire barriers* or *horizontal assemblies* used for incidental use separations in buildings of Type IIB, IIIB and VB construction is not required to be fire-resistance rated unless required by other sections of this code.

509.4.2 Protection. Where Table 509 permits an *automatic sprinkler system* without a *fire barrier*, the incidental uses shall be separated from the remainder of the building by construction capable of resisting the passage of smoke. The walls shall extend from the top of the foundation or floor assembly below to the underside of the ceiling that is a component of a fire-resistance-rated floor assembly or roof assembly above or to the underside of the floor or roof sheathing, deck or slab above. Doors shall be self- or automatic-closing upon detection of smoke in accordance with Section 716.5.9.3. Doors shall not have air transfer openings and shall not be undercut in excess of

**TABLE 509
INCIDENTAL USES**

| ROOM OR AREA | SEPARATION AND/OR PROTECTION |
|---|---|
| Furnace room where any piece of equipment is over 400,000 Btu per hour input | 1 hour or provide automatic sprinkler system |
| Rooms with boilers where the largest piece of equipment is over 15 psi and 10 horsepower | 1 hour or provide automatic sprinkler system |
| Refrigerant machinery room | 1 hour or provide automatic sprinkler system |
| Hydrogen fuel gas rooms, not classified as Group H | 1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies. |
| Incinerator rooms | 2 hours and provide automatic sprinkler system |
| Paint shops, not classified as Group H, located in occupancies other than Group F | 2 hours; or 1 hour and provide automatic sprinkler system |
| In Group E occupancies, laboratories and vocational shops not classified as Group H | 1 hour or provide automatic sprinkler system |
| In Group I-2 occupancies, laboratories not classified as Group H | 1 hour and provide automatic sprinkler system |
| In ambulatory care facilities, laboratories not classified as Group H | 1 hour or provide automatic sprinkler system |
| Laundry rooms over 100 square feet | 1 hour or provide automatic sprinkler system |
| In Group I-2, laundry rooms over 100 square feet | 1 hour |
| Group I-3 cells and Group I-2 patient rooms equipped with padded surfaces | 1 hour |
| In Group I-2, physical plant maintenance shops | 1 hour |
| In ambulatory care facilities or Group I-2 occupancies, waste and linen collection rooms with containers that have an aggregate volume of 10 cubic feet or greater | 1 hour |
| In other than ambulatory care facilities and Group I-2 occupancies, waste and linen collection rooms over 100 square feet | 1 hour or provide automatic sprinkler system |
| In ambulatory care facilities or Group I-2 occupancies, storage rooms greater than 100 square feet | 1 hour |
| Stationary storage battery systems having a liquid electrolyte capacity of more than 50 gallons for flooded lead-acid, nickel cadmium or VRLA, or more than 1,000 pounds for lithium-ion and lithium metal polymer used for facility standby power, emergency power or uninterruptable power supplies | 1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies. |

For SI: 1 square foot = 0.0929 m², 1 pound per square inch (psi) = 6.9 kPa, 1 British thermal unit (Btu) per hour = 0.293 watts, 1 horsepower = 746 watts, 1 gallon = 3.785 L, 1 cubic foot = 0.0283 m³.

the clearance permitted in accordance with NFPA 80. Walls surrounding the incidental use shall not have air transfer openings unless provided with smoke dampers in accordance with Section 710.8.

509.4.2.1 Protection limitation. Where an *automatic sprinkler system* is provided in accordance with Table 509, only the space occupied by the incidental use need be equipped with such a system.

SECTION 510 SPECIAL PROVISIONS

510.1 General. The provisions in Sections 510.2 through 510.9 shall permit the use of special conditions that are exempt from, or modify, the specific requirements of this chapter regarding the allowable *building heights and areas* of buildings based on the occupancy classification and type of construction, provided the special condition complies with the provisions specified in this section for such condition and other applicable requirements of this code. The provisions of Sections 510.2 through 510.8 are to be considered independent and separate from each other.

510.2 Horizontal building separation allowance. A building shall be considered as separate and distinct buildings for the purpose of determining area limitations, continuity of *fire walls*, limitation of number of *stories* and type of construction where all of the following conditions are met:

1. The buildings are separated with a *horizontal assembly* having a *fire-resistance rating* of not less than 3 hours.
2. The building below the *horizontal assembly* is of Type IA construction.
3. *Shaft, stairway, ramp* and escalator enclosures through the *horizontal assembly* shall have not less than a 2-hour *fire-resistance rating* with opening protectives in accordance with Section 716.5.

Exception: Where the enclosure walls below the *horizontal assembly* have not less than a 3-hour *fire-resistance rating* with opening protectives in accordance with Section 716.5, the enclosure walls extending above the *horizontal assembly* shall be permitted to have a 1-hour *fire-resistance rating*, provided:

1. The building above the *horizontal assembly* is not required to be of Type I construction;
2. The enclosure connects fewer than four *stories*; and
3. The enclosure opening protectives above the *horizontal assembly* have a *fire protection rating* of not less than 1 hour.
4. The building or buildings above the *horizontal assembly* shall be permitted to have multiple Group A occupancy uses, each with an *occupant load* of less 300, or Group B, M, R or S occupancies.
5. The building below the *horizontal assembly* shall be protected throughout by an *approved automatic sprinkler system* in accordance with Section 903.3.1.1, and

shall be permitted to be any occupancy allowed by this code except Group H.

6. The maximum *building height* in feet (mm) shall not exceed the limits set forth in Section 504.3 for the building having the smaller allowable height as measured from the *grade plane*.

510.3 Group S-2 enclosed parking garage with Group S-2 open parking garage above. A Group S-2 enclosed parking garage with not more than one *story* above *grade plane* and located below a Group S-2 *open parking garage* shall be classified as a separate and distinct building for the purpose of determining the type of construction where all of the following conditions are met:

1. The allowable area of the building shall be such that the sum of the ratios of the actual area divided by the allowable area for each separate occupancy shall not exceed 1.
2. The Group S-2 enclosed parking garage is of Type I or II construction and is at least equal to the *fire-resistance* requirements of the Group S-2 *open parking garage*.
3. The height and the number of tiers of the Group S-2 *open parking garage* shall be limited as specified in Table 406.5.4.
4. The floor assembly separating the Group S-2 enclosed parking garage and Group S-2 *open parking garage* shall be protected as required for the floor assembly of the Group S-2 enclosed parking garage. Openings between the Group S-2 enclosed parking garage and Group S-2 *open parking garage*, except *exit* openings, shall not be required to be protected.
5. The Group S-2 enclosed parking garage is used exclusively for the parking or storage of private motor vehicles, but shall be permitted to contain an office, waiting room and toilet room having a total area of not more than 1,000 square feet (93 m²) and mechanical equipment rooms incidental to the operation of the building.

510.4 Parking beneath Group R. Where a maximum one *story* above *grade plane* Group S-2 parking garage, enclosed or open, or combination thereof, of Type I construction or open of Type IV construction, with grade entrance, is provided under a building of Group R, the number of *stories* to be used in determining the minimum type of construction shall be measured from the floor above such a parking area. The floor assembly between the parking garage and the Group R above shall comply with the type of construction required for the parking garage and shall also provide a *fire-resistance rating* not less than the mixed occupancy separation required in Section 508.4.

510.5 Group R-1 and R-2 buildings of Type IIIA construction. The height limitation for buildings of Type IIIA construction in Groups R-1 and R-2 shall be increased to six *stories* and 75 feet (22 860 mm) where the first floor assembly above the *basement* has a *fire-resistance rating* of not less than 3 hours and the floor area is subdivided by 2-hour fire-resistance-rated *fire walls* into areas of not more than 3,000 square feet (279 m²).

510.6 Group R-1 and R-2 buildings of Type IIA construction. The height limitation for buildings of Type IIA construction in Groups R-1 and R-2 shall be increased to nine stories and 100 feet (30 480 mm) where the building is separated by not less than 50 feet (15 240 mm) from any other building on the lot and from lot lines, the exits are segregated in an area enclosed by a 2-hour fire-resistance-rated fire wall and the first floor assembly has a fire-resistance rating of not less than 1½ hours.

510.7 Open parking garage beneath Groups A, I, B, M and R. Open parking garages constructed under Groups A, I, B, M and R shall not exceed the height and area limitations permitted under Section 406.5. The height and area of the portion of the building above the open parking garage shall not exceed the limitations in Section 503 for the upper occupancy. The height, in both feet and stories, of the portion of the building above the open parking garage shall be measured from grade plane and shall include both the open parking garage and the portion of the building above the parking garage.

510.7.1 Fire separation. Fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 711 between the parking occupancy and the upper occupancy shall correspond to the required fire-resistance rating prescribed in Table 508.4 for the uses involved. The type of construction shall apply to each occupancy individually, except that structural members, including main bracing within the open parking structure, which is necessary to support the upper occupancy, shall be protected with the more restrictive fire-resistance-rated assemblies of the groups involved as shown in Table 601. Means of egress for the upper occupancy shall conform to Chapter 10 and shall be separated from the parking occupancy by fire barriers having not less than a 2-hour fire-resistance rating as required by Section 707 with self-closing doors complying with Section 716 or horizontal assemblies having not less than a 2-hour fire-resistance rating as required by Section 711, with self-closing doors complying with Section 716. Means of egress from the open parking garage shall comply with Section 406.5.

510.8 Group B or M buildings with Group S-2 open parking garage above. Group B or M occupancies located below a Group S-2 open parking garage of a lesser type of construction shall be considered as a separate and distinct building from the Group S-2 open parking garage for the purpose of determining the type of construction where all of the following conditions are met:

1. The buildings are separated with a horizontal assembly having a fire-resistance rating of not less than 2 hours.
2. The occupancies in the building below the horizontal assembly are limited to Groups B and M.
3. The occupancy above the horizontal assembly is limited to a Group S-2 open parking garage.

4. The building below the horizontal assembly is of Type IA construction.

Exception: The building below the horizontal assembly shall be permitted to be of Type IB or II construction, but not less than the type of construction required for the Group S-2 open parking garage above, where the building below is not greater than one story in height above grade plane.

5. The height and area of the building below the horizontal assembly does not exceed the limits set forth in Section 503.
6. The height and area of the Group S-2 open parking garage does not exceed the limits set forth in Section 406.5. The height, in both feet and stories, of the Group S-2 open parking garage shall be measured from grade plane and shall include the building below the horizontal assembly.
7. Exits serving the Group S-2 open parking garage discharge directly to a street or public way and are separated from the building below the horizontal assembly by 2-hour fire barriers constructed in accordance with Section 707 or 2-hour horizontal assemblies constructed in accordance with Section 711, or both.

510.9 Multiple buildings above a horizontal assembly. Where two or more buildings are provided above the horizontal assembly separating a Group S-2 parking garage or building below from the buildings above in accordance with the special provisions in Section 510.2, 510.3 or 510.8, the buildings above the horizontal assembly shall be regarded as separate and distinct buildings from each other and shall comply with all other provisions of this code as applicable to each separate and distinct building.

CHAPTER 6

TYPES OF CONSTRUCTION

SECTION 601 GENERAL

601.1 Scope. The provisions of this chapter shall control the classification of buildings as to type of construction.

SECTION 602 CONSTRUCTION CLASSIFICATION

602.1 General. Buildings and structures erected or to be erected, altered or extended in height or area shall be classified in one of the five construction types defined in Sections 602.2 through 602.5. The building elements shall have a *fire-resistance rating* not less than that specified in Table 601 and exterior walls shall have a *fire-resistance rating* not less than that specified in Table 602. Where required to have a *fire-resistance rating* by Table 601, building elements shall comply with the applicable provisions of Section 703.2. The protection of openings, ducts and air transfer openings in building elements shall not be required unless required by other provisions of this code.

602.1.1 Minimum requirements. A building or portion thereof shall not be required to conform to the details of a type of construction higher than that type which meets the minimum requirements based on occupancy even though

certain features of such a building actually conform to a higher type of construction.

602.2 Types I and II. Types I and II construction are those types of construction in which the building elements listed in Table 601 are of noncombustible materials, except as permitted in Section 603 and elsewhere in this code.

602.3 Type III. Type III construction is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of any material permitted by this code. *Fire-retardant-treated wood* framing complying with Section 2303.2 shall be permitted within *exterior wall* assemblies of a 2-hour rating or less.

602.4 Type IV. Type IV construction is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of solid wood, laminated wood, heavy timber (HT) or structural composite lumber (SCL) without concealed spaces. The minimum dimensions for permitted materials including solid timber, glued-laminated timber, structural composite lumber (SCL), and cross-laminated timber and details of Type IV construction shall comply with the provisions of this section and Section 2304.11. Exterior walls complying with Section 602.4.1 or 602.4.2 shall be permitted. Interior walls and partitions not less than 1-hour fire-resistance rating or heavy timber complying with Section 2304.11.2.2 shall be permitted.

**TABLE 601
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)**

| BUILDING ELEMENT | TYPE I | | TYPE II | | TYPE III | | TYPE IV | TYPE V | |
|---|-------------------------------|-------------------|-------------------|----------------|-------------------|---|---------------------|-------------------|---|
| | A | B | A | B | A | B | HT | A | B |
| Primary structural frame ^f (see Section 202) | 3 ^a | 2 ^a | 1 | 0 | 1 | 0 | HT | 1 | 0 |
| Bearing walls | | | | | | | | | |
| Exterior ^{e, f} | 3 | 2 | 1 | 0 | 2 | 2 | 2 | 1 | 0 |
| Interior | 3 ^a | 2 ^a | 1 | 0 | 1 | 0 | 1/HT | 1 | 0 |
| Nonbearing walls and partitions | See Table 602 | | | | | | | | |
| Exterior | | | | | | | | | |
| Nonbearing walls and partitions | 0 | 0 | 0 | 0 | 0 | 0 | See Section 602.4.6 | 0 | 0 |
| Interior ^d | | | | | | | | | |
| Floor construction and associated secondary members (see Section 202) | 2 | 2 | 1 | 0 | 1 | 0 | HT | 1 | 0 |
| Roof construction and associated secondary members (see Section 202) | 1 ^{1/2} ^b | 1 ^{b, c} | 1 ^{b, c} | 0 ^c | 1 ^{b, c} | 0 | HT | 1 ^{b, c} | 0 |

For SI: 1 foot = 304.8 mm.

- a. Roof supports: Fire-resistance ratings of primary structural frame and bearing walls are permitted to be reduced by 1 hour where supporting a roof only.
- b. Except in Group F-1, H, M and S-1 occupancies, fire protection of structural members shall not be required, including protection of roof framing and decking where every part of the roof construction is 20 feet or more above any floor immediately below. Fire-retardant-treated wood members shall be allowed to be used for such unprotected members.
- c. In all occupancies, heavy timber complying with Section 2304.11 shall be allowed where a 1-hour or less fire-resistance rating is required.
- d. Not less than the fire-resistance rating required by other sections of this code.
- e. Not less than the fire-resistance rating based on fire separation distance (see Table 602).
- f. Not less than the fire-resistance rating as referenced in Section 704.10.

TABLE 602
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE^{a, d, g}

| FIRE SEPARATION DISTANCE = X (feet) | TYPE OF CONSTRUCTION | OCCUPANCY GROUP H ^e | OCCUPANCY GROUP F-1, M, S-1 ^f | OCCUPANCY GROUP A, B, E, F-2, I, R, S-2, U ^h |
|--|-----------------------------|--------------------------------|---|--|
| $X < 5^b$ | All | 3 | 2 | 1 |
| $5 \leq X < 10$ | IA Others | 3 2 | 2 1 | 1 1 |
| $10 \leq X < 30$ | IA, IB IIB, VB Others | 2 1 1 | 1 0 1 | 1 ^c 0 1 ^c |
| $X \geq 30$ | All | 0 | 0 | 0 |

For SI: 1 foot = 304.8 mm.

a. Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 601.

b. See Section 706.1.1 for party walls.

c. Open parking garages complying with Section 406 shall not be required to have a fire-resistance rating.

d. The fire-resistance rating of an exterior wall is determined based upon the fire separation distance of the exterior wall and the story in which the wall is located.

e. For special requirements for Group H occupancies, see Section 415.6.

f. For special requirements for Group S aircraft hangars, see Section 412.4.1.

g. Where Table 705.8 permits nonbearing exterior walls with unlimited area of unprotected openings, the required fire-resistance rating for the exterior walls is 0 hours.

h. For a building containing only a Group U occupancy private garage or carport, the exterior wall shall not be required to have a fire-resistance rating where the fire separation distance is 5 feet (1523 mm) or greater.

602.4.1 Fire-retardant-treated wood in exterior walls.

Fire-retardant-treated wood framing complying with Section 2303.2 shall be permitted within exterior wall assemblies with a 2-hour rating or less.

602.4.2 Cross-laminated timber in exterior walls.

Cross-laminated timber complying with Section 2303.1.4 shall be permitted within exterior wall assemblies not less than 6 inches (152 mm) in thickness with a 2-hour rating or less, provided the exterior surface of the cross-laminated timber is protected by one the following:

1. *Fire-retardant-treated wood* sheathing complying with Section 2303.2 and not less than $1\frac{5}{32}$ inch (12 mm) thick.
2. *Gypsum board* not less than $\frac{1}{2}$ inch (12.7 mm) thick.
3. A noncombustible material.

602.4.3 through 602.4.8 [Reserved]

602.4.9 Exterior structural members. Where a horizontal separation of 20 feet (6096 mm) or more is provided, wood columns and arches conforming to heavy timber sizes complying with Section 2304.11 shall be permitted to be used externally.

602.5 Type V. Type V construction is that type of construction in which the structural elements, *exterior walls* and interior walls are of any materials permitted by this code.

SECTION 603 COMBUSTIBLE MATERIAL IN TYPES I AND II CONSTRUCTION

603.1 Allowable materials. Combustible materials shall be permitted in buildings of Type I or II construction in the following applications and in accordance with Sections 603.1.1 through 603.1.3:

1. *Fire-retardant-treated wood* shall be permitted in:
 - 1.1. Nonbearing partitions where the required *fire-resistance rating* is 2 hours or less.
 - 1.2. Nonbearing *exterior walls* where fire-resistance-rated construction is not required.
 - 1.3. Roof construction, including girders, trusses, framing and decking.

Exception: In buildings of Type IA construction exceeding two *stories above grade plane*, *fire-retardant-treated wood* is not permitted in roof construction where the vertical distance from the upper floor to the roof is less than 20 feet (6096 mm).

2. Thermal and acoustical insulation, other than foam plastics, having a *flame spread index* of not more than 25.

Exceptions:

1. Insulation placed between two layers of noncombustible materials without an intervening airspace shall be allowed to have a *flame spread index* of not more than 100.

2. Insulation installed between a finished floor and solid decking without intervening airspace shall be allowed to have a *flame spread index* of not more than 200.
 3. Foam plastics in accordance with Chapter 26.
 4. Roof coverings that have an A, B or C classification.
 5. *Interior floor finish* and floor covering materials installed in accordance with Section 804.
 6. Millwork such as doors, door frames, window sashes and frames.
 7. *Interior wall and ceiling finishes* installed in accordance with Sections 801 and 803.
 8. *Trim* installed in accordance with Section 806.
 9. Where not installed greater than 15 feet (4572 mm) above grade, show windows, nailing or furring strips and wooden bulkheads below show windows, including their frames, aprons and show cases.
 10. Finish flooring installed in accordance with Section 805.
 11. Partitions dividing portions of stores, offices or similar places occupied by one tenant only and that do not establish a *corridor* serving an *occupant load* of 30 or more shall be permitted to be constructed of *fire-retardant-treated wood*, 1-hour fire-resistance-rated construction or of wood panels or similar light construction up to 6 feet (1829 mm) in height.
 12. Stages and platforms constructed in accordance with Sections 410.3 and 410.4, respectively.
 13. Combustible *exterior wall coverings*, balconies and similar projections and bay or oriel windows in accordance with Chapter 14.
 14. Blocking such as for handrails, millwork, cabinets and window and door frames.
 15. Light-transmitting plastics as permitted by Chapter 26.
 16. Mastics and caulking materials applied to provide flexible seals between components of *exterior wall* construction.
 17. Exterior plastic veneer installed in accordance with Section 2605.2.
 18. Nailing or furring strips as permitted by Section 803.13.
 19. Heavy timber as permitted by Note c to Table 601 and Sections 602.4.3 and 705.2.3.
 20. Aggregates, component materials and admixtures as permitted by Section 703.2.2.
 21. Sprayed fire-resistant materials and intumescent and mastic fire-resistant coatings, determined on the basis of *fire resistance* tests in accordance with Section 703.2 and installed in accordance with Sections 1705.14 and 1705.15, respectively.
 22. Materials used to protect penetrations in fire-resistance-rated assemblies in accordance with Section 714.
 23. Materials used to protect joints in fire-resistance-rated assemblies in accordance with Section 715.
 24. Materials allowed in the concealed spaces of buildings of Types I and II construction in accordance with Section 718.5.
 25. Materials exposed within plenums complying with Section 602 of the *Mechanical Code*.
 26. Wall construction of freezers and coolers of less than 1,000 square feet (92.9 m²), in size, lined on both sides with noncombustible materials and the building is protected throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
- 603.1.1 Ducts.** The use of nonmetallic ducts shall be permitted where installed in accordance with the limitations of the *Mechanical Code*.
- 603.1.2 Piping.** The use of combustible piping materials shall be permitted where installed in accordance with the limitations of the *Mechanical Code* and the *Plumbing Code*.
- 603.1.3 Electrical.** The use of electrical wiring methods with combustible insulation, tubing, raceways and related components shall be permitted where installed in accordance with the limitations of this code.

CHAPTER 7

FIRE AND SMOKE PROTECTION FEATURES

SECTION 701 GENERAL

701.1 Scope. The provisions of this chapter shall govern the materials, systems and assemblies used for structural *fire resistance* and fire-resistance-rated construction separation of adjacent spaces to safeguard against the spread of fire and smoke within a building and the spread of fire to or from buildings.

701.2 Multiple use fire assemblies. Fire assemblies that serve multiple purposes in a building shall comply with all of the requirements that are applicable for each of the individual fire assemblies.

SECTION 702 DEFINITIONS

702.1 Definitions. The following terms are defined in Chapter 2:

ANNULAR SPACE.
BUILDING ELEMENT.
CEILING RADIATION DAMPER.
COMBINATION FIRE/SMOKE DAMPER.
CORRIDOR DAMPER.
DAMPER.
DRAFTSTOP
F RATING.
FIRE BARRIER.
FIRE DAMPER.
FIRE DOOR.
FIRE DOOR ASSEMBLY.
FIRE PARTITION.
FIRE PROTECTION RATING.
FIRE-RATED GLAZING.
FIRE RESISTANCE.
FIRE-RESISTANCE RATING.
FIRE-RESISTANT JOINT SYSTEM.
FIRE SEPARATION DISTANCE.
FIRE WALL.
FIRE WINDOW ASSEMBLY.
FIREBLOCKING.
FLOOR FIRE DOOR ASSEMBLY.
HORIZONTAL ASSEMBLY.
JOINT.

L RATING.
MEMBRANE PENETRATION.
MEMBRANE-PENETRATION FIRESTOP.
MEMBRANE-PENETRATION FIRESTOP SYSTEM.
MINERAL FIBER.
MINERAL WOOL.
PENETRATION FIRESTOP.
SELF-CLOSING.
SHAFT.
SHAFT ENCLOSURE.
SMOKE BARRIER.
SMOKE COMPARTMENT.
SMOKE DAMPER.
SPLICE.
T RATING.
THROUGH PENETRATION.
THROUGH-PENETRATION FIRESTOP SYSTEM.

SECTION 703 FIRE-RESISTANCE RATINGS AND FIRE TESTS

703.1 Scope. Materials prescribed herein for *fire resistance* shall conform to the requirements of this chapter.

703.2 Fire-resistance ratings. The *fire-resistance rating* of building elements, components or assemblies shall be determined in accordance with the test procedures set forth in ASTM E119 or UL 263 or in accordance with Section 703.3. The *fire-resistance rating* of penetrations and fire-resistant joint systems shall be determined in accordance Sections 714 and 715, respectively.

703.2.1 Nonsymmetrical wall construction. Interior walls and partitions of nonsymmetrical construction shall be tested with both faces exposed to the furnace, and the assigned *fire-resistance rating* shall be the shortest duration obtained from the two tests conducted in compliance with ASTM E119 or UL 263. Where evidence is furnished to show that the wall was tested with the least fire-resistant side exposed to the furnace, subject to acceptance of the *building official*, the wall need not be subjected to tests from the opposite side (see Section 705.5 for *exterior walls*).

703.2.2 Combustible components. Combustible aggregates are permitted in gypsum and Portland cement concrete mixtures for fire-resistance-rated construction. Any component material or admixture is permitted in assemblies if the resulting tested assembly meets the fire-resistance test requirements of this code.

703.2.3 Restrained classification. Fire-resistance-rated assemblies tested under ASTM E119 or UL 263 shall not be considered to be restrained unless evidence satisfactory to the *building official* is furnished by the *registered design professional* showing that the construction qualifies for a restrained classification in accordance with ASTM E119 or UL 263. Restrained construction shall be identified on the *construction documents*.

703.2.4 Supplemental features. Where materials, systems or devices that have not been tested as part of a fire-resistance-rated assembly are incorporated into the building element, component or assembly, sufficient data shall be made available to the *building official* to show that the required *fire-resistance rating* is not reduced.

703.2.5 Exterior bearing walls. In determining the *fire-resistance rating* of exterior bearing walls, compliance with the ASTM E119 or UL 263 criteria for unexposed surface temperature rise and ignition of cotton waste due to passage of flame or gases is required only for a period of time corresponding to the required *fire-resistance rating* of an exterior nonbearing wall with the same *fire separation distance*, and in a building of the same group. Where the *fire-resistance rating* determined in accordance with this exception exceeds the *fire-resistance rating* determined in accordance with ASTM E119 or UL 263, the fire exposure time period, water pressure and application duration criteria for the hose stream test of ASTM E119 or UL 263 shall be based on the *fire-resistance rating* determined in accordance with this section.

703.3 Methods for determining fire resistance. The application of any of the methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E119 or UL 263. The required *fire resistance* of a building element, component or assembly shall be permitted to be established by any of the following methods or procedures:

1. Fire-resistance designs documented in approved sources.
2. Prescriptive designs of fire-resistance-rated building elements, components or assemblies as prescribed in Section 721.
3. Calculations in accordance with Section 722.
4. Engineering analysis based on a comparison of building element, component or assemblies designs having *fire-resistance ratings* as determined by the test procedures set forth in ASTM E119 or UL 263.
5. Alternative protection methods as allowed by Section 104.11.
6. Fire-resistance designs certified by an approved agency.

703.4 Automatic sprinklers. Under the prescriptive fire-resistance requirements of this code, the *fire-resistance rating* of a building element, component or assembly shall be established without the use of *automatic sprinklers* or any other fire suppression system being incorporated as part of the

assembly tested in accordance with the fire exposure, procedures and acceptance criteria specified in ASTM E119 or UL 263. However, this section shall not prohibit or limit the duties and powers of the *building official* allowed by Sections 104.10 and 104.11.

703.5 Noncombustibility tests. The tests indicated in Sections 703.5.1 and 703.5.2 shall serve as criteria for acceptance of building materials as set forth in Sections 602.2, 602.3 and 602.4 in Type I, II, III and IV construction. The term “noncombustible” does not apply to the flame spread characteristics of *interior finish* or *trim* materials. A material shall not be classified as a noncombustible building construction material if it is subject to an increase in combustibility or flame spread beyond the limitations herein established through the effects of age, moisture or other atmospheric conditions.

703.5.1 Elementary materials. Materials required to be noncombustible shall be tested in accordance with ASTM E136.

703.5.2 Composite materials. Materials having a structural base of noncombustible material as determined in accordance with Section 703.5.1 with a surfacing not more than 0.125 inch (3.18 mm) thick that has a *flame spread index* not greater than 50 when tested in accordance with ASTM E84 or UL 723 shall be acceptable as noncombustible materials.

703.6 Fire-resistance-rated glazing. Fire-resistance-rated glazing, when tested in accordance with ASTM E119 or UL 263 and complying with the requirements of Section 707, shall be permitted. Fire-resistance-rated glazing shall bear a *label* marked in accordance with Table 716.3 issued by an agency and shall be permanently identified on the glazing.

703.7 Marking and identification. Where there is an accessible concealed floor, floor-ceiling or *attic* space, *fire walls*, *fire barriers*, *fire partitions*, *smoke barriers* and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling in the concealed space. Such identification shall:

1. Be located within 15 feet (4572 mm) of the end of each wall and at intervals not exceeding 30 feet (9144 mm) measured horizontally along the wall or partition.
2. Include lettering not less than 3 inches (76 mm) in height with a minimum $\frac{3}{8}$ -inch (9.5 mm) stroke in a contrasting color incorporating the suggested wording, “FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS,” or other wording.

SECTION 704 FIRE-RESISTANCE RATING OF STRUCTURAL MEMBERS

704.1 Requirements. The *fire-resistance ratings* of structural members and assemblies shall comply with this section and the requirements for the type of construction as specified in Table 601. The *fire-resistance ratings* shall be not less than

the ratings required for the fire-resistance-rated assemblies supported by the structural members.

Exception: *Fire barriers, fire partitions, smoke barriers and horizontal assemblies* as provided in Sections 707.5, 708.4, 709.4 and 711.2, respectively.

704.2 Column protection. Where columns are required to have protection to achieve a *fire-resistance rating*, the entire column shall be provided individual encasement protection by protecting it on all sides for the full column height, including connections to other structural members, with materials having the required *fire-resistance rating*. Where the column extends through a ceiling, the encasement protection shall be continuous from the top of the foundation or floor/ceiling assembly below through the ceiling space to the top of the column.

704.3 Protection of the primary structural frame other than columns. Members of the primary structural frame other than columns that are required to have protection to achieve a *fire-resistance rating* and support more than two floors or one floor and roof, or support a load-bearing wall or a nonload-bearing wall more than two stories high, shall be provided individual encasement protection by protecting them on all sides for the full length, including connections to other structural members, with materials having the required *fire-resistance rating*.

Exception: Individual encasement protection on all sides shall be permitted on all exposed sides provided the extent of protection is in accordance with the required *fire-resistance rating*, as determined in Section 703.

704.4 Protection of secondary members. Secondary members that are required to have protection to achieve a *fire-resistance rating* shall be protected by individual encasement protection.

704.4.1 Light-frame construction. Studs and boundary elements that are integral elements in *load-bearing walls* of light-frame construction shall be permitted to have required *fire-resistance ratings* provided by the membrane protection provided for the *load-bearing wall*.

704.4.2 Horizontal assemblies. *Horizontal assemblies* are permitted to be protected with a membrane or ceiling where the membrane or ceiling provides the required *fire-resistance rating* and is installed in accordance with Section 711.

704.5 Truss protection. The required thickness and construction of fire-resistance-rated assemblies enclosing trusses shall be based on the results of full-scale tests or combinations of tests on truss components or on *approved* calculations based on such tests that satisfactorily demonstrate that the assembly has the required *fire resistance*.

704.6 Attachments to structural members. The edges of lugs, brackets, rivets and bolt heads attached to structural members shall be permitted to extend to within 1 inch (25 mm) of the surface of the fire protection.

704.7 Reinforcing. Thickness of protection for concrete or masonry reinforcement shall be measured to the outside of

the reinforcement except that stirrups and spiral reinforcement ties are permitted to project not more than 0.5-inch (12.7 mm) into the protection.

704.8 Embedments and enclosures. Pipes, wires, conduits, ducts or other service facilities shall not be embedded in the required fire protective covering of a structural member that is required to be individually encased.

704.9 Impact protection. Where the fire protective covering of a structural member is subject to impact damage from moving vehicles, the handling of merchandise or other activity, the fire protective covering shall be protected by corner guards or by a substantial jacket of metal or other noncombustible material to a height adequate to provide full protection, but not less than 5 feet (1524 mm) from the finished floor.

Exception: Corner protection is not required on concrete columns in open or enclosed parking garages.

704.10 Exterior structural members. Load-bearing structural members located within the *exterior walls* or on the outside of a building or structure shall be provided with the highest *fire-resistance rating* as determined in accordance with the following:

1. As required by Table 601 for the type of building element based on the type of construction of the building;
2. As required by Table 601 for exterior bearing walls based on the type of construction; and
3. As required by Table 602 for *exterior walls* based on the *fire separation distance*.

704.11 Bottom flange protection. Fire protection is not required at the bottom flange of lintels, shelf angles and plates, spanning not more than 6 feet 4 inches (1931 mm) whether part of the primary structural frame or not, and from the bottom flange of lintels, shelf angles and plates not part of the structural frame, regardless of span.

704.12 Seismic isolation systems. *Fire-resistance ratings* for the isolation system shall meet the *fire-resistance rating* required for the columns, walls or other structural elements in which the isolation system is installed in accordance with Table 601. Isolation systems required to have a *fire-resistance rating* shall be protected with *approved* materials or construction assemblies designed to provide the same degree of *fire resistance* as the structural element in which the system is installed when tested in accordance with ASTM E119 or UL 263 (see Section 703.2).

Such isolation system protection applied to isolator units shall be capable of retarding the transfer of heat to the isolator unit in such a manner that the required gravity load-carrying capacity of the isolator unit will not be impaired after exposure to the standard time-temperature curve fire test prescribed in ASTM E119 or UL 263 for a duration not less than that required for the *fire-resistance rating* of the structure element in which the system is installed.

Such isolation system protection applied to isolator units shall be suitably designed and securely installed so as not to dislodge, loosen, sustain damage or otherwise impair its abil-

ity to accommodate the seismic movements for which the isolator unit is designed and to maintain its integrity for the purpose of providing the required fire-resistance protection.

704.13 Sprayed fire-resistant materials (SFRM). Sprayed fire-resistant materials (SFRM) shall comply with Sections 704.13.1 through 704.13.5.

704.13.1 Fire-resistance rating. The application of SFRM shall be consistent with the *fire-resistance rating* and the listing, including, but not limited to, minimum thickness and dry density of the applied SFRM, method of application, substrate surface conditions and the use of bonding adhesives, sealants, reinforcing or other materials.

704.13.2 Manufacturer's installation instructions. The application of SFRM shall be in accordance with the manufacturer's installation instructions. The instructions shall include, but are not limited to, substrate temperatures and surface conditions and SFRM handling, storage, mixing, conveyance, method of application, curing and ventilation.

704.13.3 Substrate condition. The SFRM shall be applied to a substrate in compliance with Sections 704.13.3.1 through 704.13.3.2.

704.13.3.1 Surface conditions. Substrates to receive SFRM shall be free of dirt, oil, grease, release agents, loose scale and any other condition that prevents adhesion. The substrates shall be free of primers, paints and encapsulants other than those fire tested and *listed* by a nationally recognized testing agency. Primed, painted or encapsulated steel shall be allowed, provided that testing has demonstrated that required adhesion is maintained.

704.13.3.2 Primers, paints and encapsulants. Where the SFRM is to be applied over primers, paints or encapsulants other than those specified in the listing, the material shall be field tested in accordance with ASTM E736. Where testing of the SFRM with primers, paints or encapsulants demonstrates that required adhesion is maintained, SFRM shall be permitted to be applied to primed, painted or encapsulated wide flange steel shapes in accordance with the following conditions:

1. The beam flange width does not exceed 12 inches (305 mm); or
2. The column flange width does not exceed 16 inches (400 mm); or
3. The beam or column web depth does not exceed 16 inches (400 mm).
4. The average and minimum bond strength values shall be determined based on a minimum of five bond tests conducted in accordance with ASTM E736. Bond tests conducted in accordance with ASTM E736 shall indicate an average bond strength of not less than 80 percent and an individual bond strength of not less than 50 percent, when compared to the bond strength of the SFRM as applied to clean uncoated $\frac{1}{8}$ -inch-thick (3.2 mm) steel plate.

704.13.4 Temperature. A minimum ambient and substrate temperature of 40°F (4.44°C) shall be maintained during and for not fewer than 24 hours after the application of the SFRM, unless the manufacturer's instructions allow otherwise.

704.13.5 Finished condition. The finished condition of SFRM applied to structural members or assemblies shall not, upon complete drying or curing, exhibit cracks, voids, spalls, delamination or any exposure of the substrate. Surface irregularities of SFRM shall be deemed acceptable.

SECTION 705 EXTERIOR WALLS

705.1 General. *Exterior walls* shall comply with this section.

705.2 Projections. Cornices, eave overhangs, exterior balconies and similar projections extending beyond the exterior wall shall conform to the requirements of this section and Section 1406. Exterior egress balconies and exterior exit stairways and ramps shall comply with Sections 1021 and 1027, respectively. Projections shall not extend any closer to the line used to determine the fire separation distance than shown in Table 705.2.

Exception: Buildings on the same lot and considered as portions of one building in accordance with Section 705.3 are not required to comply with this section for projections between the buildings.

**TABLE 705.2
MINIMUM DISTANCE OF PROJECTION**

| FIRE SEPARATION DISTANCE (FSD) | MINIMUM DISTANCE FROM LINE USED TO DETERMINE FSD |
|--|---|
| 0 feet to 2 feet | Projections not permitted |
| Greater than 2 feet to 3 feet | 24 inches |
| Greater than 3 feet to less than 30 feet | 24 inches plus 8 inches for every foot of FSD beyond 3 feet or fraction thereof |
| 30 feet or greater | 20 feet |

For SI: 1 foot = 304.8 mm; 1 inch = 25.4 mm.

705.2.1 Type I and II construction. Projections from walls of Type I or II construction shall be of noncombustible materials or combustible materials as allowed by Sections 1406.3 and 1406.4.

705.2.2 Type III, IV or V construction. Projections from walls of Type III, IV or V construction shall be of any *approved* material.

705.2.3 Combustible projections. Combustible projections extending to within 5 feet (1524 mm) of the line used to determine the *fire separation distance* shall be of not less than 1-hour *fire-resistance-rated* construction, Type IV construction, *fire-retardant-treated wood* or as required by Section 1406.3.

Exception: Type VB construction shall be allowed for combustible projections in Group R-3 and U occupancies with a fire separation distance greater than or equal to 5 feet (1524 mm).

705.3 Buildings on the same lot. For the purposes of determining the required wall and opening protection, projections and roof-covering requirements, buildings on the same lot shall be assumed to have an imaginary line between them.

Where a new building is to be erected on the same lot as an existing building, the location of the assumed imaginary line with relation to the existing building shall be such that the *exterior wall* and opening protection of the existing building meet the criteria as set forth in Sections 705.5 and 705.8.

Exceptions:

1. Two or more buildings on the same lot shall be either regulated as separate buildings or shall be considered as portions of one building if the aggregate area of such buildings is within the limits specified in Chapter 5 for a single building. Where the buildings contain different occupancy groups or are of different types of construction, the area shall be that allowed for the most restrictive occupancy or construction.
2. Where an S-2 parking garage of Construction Type I or IIA is erected on the same lot as a Group R-2 building, and there is no *fire separation distance* between these buildings, then the adjoining *exterior walls* between the buildings are permitted to have occupant use openings in accordance with Section 706.8. However, opening protectives in such openings shall only be required in the exterior wall of the S-2 parking garage, not in the exterior wall openings in the R-2 building, and these opening protectives in the exterior wall of the S-2 parking garage shall be not less than 1½-hour *fire protection rating*.

705.4 Materials. *Exterior walls* shall be of materials permitted by the building type of construction.

705.5 Fire-resistance ratings. *Exterior walls* shall be fire-resistance rated in accordance with Tables 601 and 602 and this section. The required *fire-resistance rating* of *exterior walls* with a *fire separation distance* of greater than 10 feet (3048 mm) shall be rated for exposure to fire from the inside. The required *fire-resistance rating* of *exterior walls* with a *fire separation distance* of less than or equal to 10 feet (3048 mm) shall be rated for exposure to fire from both sides.

705.6 Structural stability. *Exterior walls* shall extend to the height required by Section 705.11. Interior structural elements that brace the exterior wall but that are not located within the plane of the exterior wall shall have the minimum *fire-resistance rating* required in Table 601 for that structural element. Structural elements that brace the exterior wall but are located outside of the exterior wall or within the plane of the exterior wall shall have the minimum *fire-resistance rating* required in Tables 601 and 602 for the exterior wall.

705.7 Unexposed surface temperature. Where protected openings are not limited by Section 705.8, the limitation on the rise of temperature on the unexposed surface of *exterior walls* as required by ASTM E119 or UL 263 shall not apply.

Where protected openings are limited by Section 705.8, the limitation on the rise of temperature on the unexposed surface of *exterior walls* as required by ASTM E119 or UL 263 shall not apply provided that a correction is made for radiation from the unexposed *exterior wall* surface in accordance with the following formula:

$$A_e = A + (A_f \times F_{eo}) \quad \text{(Equation 7-1)}$$

where:

A_e = Equivalent area of protected openings.

A = Actual area of protected openings.

A_f = Area of *exterior wall* surface in the *story* under consideration exclusive of openings, on which the temperature limitations of ASTM E119 or UL 263 for walls are exceeded.

F_{eo} = An “equivalent opening factor” derived from Figure 705.7 based on the average temperature of the unexposed wall surface and the *fire-resistance rating* of the wall.

705.8 Openings. Openings in *exterior walls* shall comply with Sections 705.8.1 through 705.8.7.

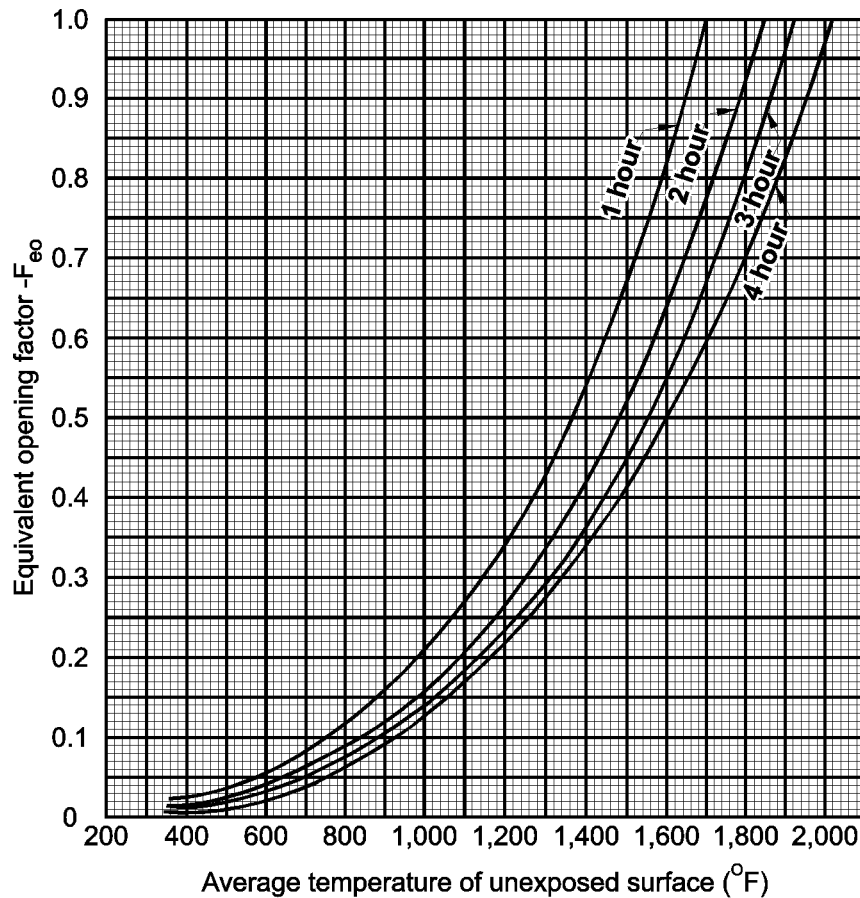
705.8.1 Allowable area of openings. The maximum area of unprotected and protected openings permitted in an *exterior wall* in any *story* of a *building* shall not exceed the percentages specified in Table 705.8.

Exceptions:

1. Openings permitted by Section 705.8.7.
2. In other than Group H occupancies, unlimited unprotected openings are permitted in the first *story* above grade plane either:
 - 2.1 Where the wall faces a street and has a *fire separation distance* of more than 15 feet (4572 mm).
 - 2.2 Where the wall faces an unoccupied space. The unoccupied space shall be on the same *lot* or dedicated for public use, shall not be less than 30 feet (9144 mm) in width and shall have access from a street via a posted fire lane in accordance with the *Fire Code*.
3. *Buildings*, whose exterior bearing walls, exterior nonbearing walls, and exterior primary structural frame are not required to be fire-resistance rated and shall be permitted to have unlimited unprotected openings.

705.8.2 Protected openings. Where openings are required to be protected, *fire doors* and fire shutters shall comply with Section 716.5 and *fire window assemblies* shall comply with Section 716.6.

Exception: Opening protectives are not required where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 and the exterior openings are protected by a water curtain using automatic sprinklers *approved* for that use.



For SI: $^{\circ}\text{C} = [(^{\circ}\text{F}) - 32] / 1.8$.

FIGURE 705.7
EQUIVALENT OPENING FACTOR

705.8.3 Unprotected openings. Where unprotected openings are permitted, windows and doors shall be constructed of any *approved* materials. Glazing shall conform to the requirements of Chapters 24 and 26.

705.8.4 Mixed openings. Where both unprotected and protected openings are located in the *exterior wall* in any *story* of a building, the total area of openings shall be determined in accordance with the following:

$$(A_p/a_p) + (A_u/a_u) \leq 1 \quad (\text{Equation 7-2})$$

where:

A_p = Actual area of protected openings, or the equivalent area of protected openings, A_e (see Section 705.7).

a_p = Allowable area of protected openings.

A_u = Actual area of unprotected openings.

a_u = Allowable area of unprotected openings.

705.8.5 Vertical separation of openings. Openings in *exterior walls* in adjacent *stories* shall be separated verti-

cally to protect against fire spread on the exterior of the buildings where the openings are within 5 feet (1524 mm) of each other horizontally and the opening in the lower *story* is not a protected opening with a *fire protection rating* of not less than $3/4$ hour. Such openings shall be separated vertically not less than 3 feet (914 mm) by spandrel girders, *exterior walls* or other similar assemblies that have a *fire-resistance rating* of not less than 1 hour, rated for exposure to fire from both sides, or by flame barriers that extend horizontally not less than 30 inches (762 mm) beyond the *exterior wall*. Flame barriers shall have a *fire-resistance rating* of not less than 1 hour. The unexposed surface temperature limitations specified in ASTM E119 or UL 263 shall not apply to the flame barriers or vertical separation unless otherwise required by the provisions of this code.

Exceptions:

1. This section shall not apply to buildings that are three *stories* or less above *grade plane*.

TABLE 705.8
MAXIMUM AREA OF EXTERIOR WALL OPENINGS BASED ON
FIRE SEPARATION DISTANCE AND DEGREE OF OPENING PROTECTION

| FIRE SEPARATION DISTANCE (feet) | DEGREE OF OPENING PROTECTION | ALLOWABLE AREA ^a |
|--|---|-----------------------------|
| 0 to less than 3 ^{b, c, k} | Unprotected, Nonsprinklered (UP, NS) | Not Permitted ^k |
| | Unprotected, Sprinklered (UP, S) ⁱ | Not Permitted ^k |
| | Protected (P) | Not Permitted ^k |
| 3 to less than 5 ^{d, e} | Unprotected, Nonsprinklered (UP, NS) | Not Permitted |
| | Unprotected, Sprinklered (UP, S) ⁱ | 15% |
| | Protected (P) | 15% |
| 5 to less than 10 ^{e, f, j} | Unprotected, Nonsprinklered (UP, NS) | 10% ^h |
| | Unprotected, Sprinklered (UP, S) ⁱ | 25% |
| | Protected (P) | 25% |
| 10 to less than 15 ^{e, f, g, j} | Unprotected, Nonsprinklered (UP, NS) | 15% ^h |
| | Unprotected, Sprinklered (UP, S) ⁱ | 45% |
| | Protected (P) | 45% |
| 15 to less than 20 ^{f, g, j} | Unprotected, Nonsprinklered (UP, NS) | 25% |
| | Unprotected, Sprinklered (UP, S) ⁱ | 75% |
| | Protected (P) | 75% |
| 20 to less than 25 ^{f, g, j} | Unprotected, Nonsprinklered (UP, NS) | 45% |
| | Unprotected, Sprinklered (UP, S) ⁱ | No Limit |
| | Protected (P) | No Limit |
| 25 to less than 30 ^{f, g, j} | Unprotected, Nonsprinklered (UP, NS) | 70% |
| | Unprotected, Sprinklered (UP, S) ⁱ | No Limit |
| | Protected (P) | No Limit |
| 30 or greater | Unprotected, Nonsprinklered (UP, NS) | No Limit |
| | Unprotected, Sprinklered (UP, S) ⁱ | No Limit |
| | Protected (P) | No Limit |

For SI: 1 foot = 304.8 mm.

UP, NS = Unprotected openings in buildings not equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

UP, S = Unprotected openings in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

P = Openings protected with an opening protective assembly in accordance with Section 705.8.2.

a. Values indicated are the percentage of the area of the exterior wall, per story.

b. For the requirements for fire walls of buildings with differing heights, see Section 706.6.1.

c. For openings in a fire wall for buildings on the same lot, see Section 706.8.

d. The maximum percentage of unprotected and protected openings shall be 25 percent for Group R-3 occupancies.

e. Unprotected openings shall not be permitted for openings with a fire separation distance of less than 15 feet for Group H-2 and H-3 occupancies.

f. The area of unprotected and protected openings shall not be limited for Group R-3 occupancies, with a fire separation distance of 5 feet or greater.

g. The area of openings in an open parking structure with a fire separation distance of 10 feet or greater shall not be limited.

h. Includes buildings accessory to Group R-3.

i. Not applicable to Group H-1, H-2 and H-3 occupancies.

j. The area of openings in a building containing only a Group U occupancy private garage or carport with a fire separation distance of 5 feet (1523 mm) or greater shall not be limited.

k. For openings between S-2 parking garage and Group R-2 building, see Section 705.3, Exception 2.

2. This section shall not apply to buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.

3. Open parking garages.

705.8.6 Vertical exposure. For buildings on the same lot, opening protectives having a *fire protection rating* of not less than $\frac{3}{4}$ hour shall be provided in every opening that is less than 15 feet (4572 mm) vertically above the roof of an adjacent building or structure based on assuming an imaginary line between them. The opening protectives are

required where the *fire separation distance* between the imaginary line and the adjacent building or structure is less than 15 feet (4572 mm).

Exceptions:

1. Opening protectives are not required where the roof assembly of the adjacent building or structure has a *fire-resistance rating* of not less than 1 hour for a minimum distance of 10 feet (3048 mm) from the *exterior wall* facing the imaginary line and the entire length and span of the support-

ing elements for the fire-resistance-rated roof assembly has a *fire-resistance rating* of not less than 1 hour.

2. Buildings on the same lot and considered as portions of one building in accordance with Section 705.3 are not required to comply with Section 705.8.6.

705.8.7 At-risk openings allowed 15 feet or less from adjacent structures or premises. Notwithstanding Table 705.8, *exterior walls* of *buildings* with a *fire separation distance* of 15 feet (4572 mm) or less shall be permitted to have openings if the *building* contains occupancies other than Group H, and is equipped throughout with sprinklers in accordance with Section 903, subject to the restrictions of Sections 705.8.7.1 through 705.8.7.8.

Exceptions:

1. Nothing in this code shall be construed to allow mechanical or plumbing openings in exterior walls that would not otherwise be allowed by this code or by the *Mechanical Code* or *Plumbing Code*.
2. Openings allowed pursuant to this section shall not be counted towards requirements of the *Construction Codes* for emergency egress, natural light, natural ventilation, or smoke control.
3. *Buildings* on the same lot and considered as portions of one *building* in accordance with Section 705.3 are not required to comply with Sections 705.8.7.1 through 705.8.7.6.

705.8.7.1 Abutting buildings. A limited number of door openings between two abutting *buildings*, protected in accordance with Section 705.8.7.5, shall be permitted when all of the following occur:

1. The openings are approved by the *code official* as not posing an undue hazard to life safety.
2. The *owners* of both *buildings* provide written authorization for the openings.
3. Both *buildings* are subject to the covenant required by Section 705.8.7.8.

705.8.7.2 Horizontal exposure. Those stories that directly face other *buildings* or *structures* located either on the same lot or on an adjacent lot, having a distance between *buildings* of 15 feet (4572 mm) or less, shall comply with Sections 705.8.7.2.1 through 705.8.7.2.3.

705.8.7.2.1 Exposure by adjacent structure less than 3 feet away. Those portions of the *exterior walls* of a *story* that directly face another *structure* and have a distance to the adjacent *structure* of less than 3 feet (914 mm) shall have no openings, unless permitted by Table 705.8.

705.8.7.2.2 Exposure by adjacent structure between 3 and 10 feet away. Those portions of the *exterior walls* of a *story* that directly face another *structure* and have a distance to the adjacent *structure* of 3 feet (914 mm) to less than 10 feet (3046 mm) shall have no more than 45 percent openings.

705.8.7.2.3 Exposure by adjacent structure between 10 and 15 feet. Those portions of the *exterior walls* of a story that directly face another *structure* and have a distance to the adjacent *structure* of 10 feet (3046 mm) to less than 15 feet (4572 mm) shall comply with Section 705.8.7.2.2 or with Table 705.8.

705.8.7.3 Vertical exposure. Those *stories* that extend higher than the adjacent *building* or *premises*, but do not project over the adjacent *building* or *premises*, shall comply with Sections 705.8.7.3.1 and 705.8.7.3.2.

705.8.7.3.1 Less than 3 feet horizontally. No openings are allowed in those portions of the *exterior walls* of a *story* that meet both of the following conditions:

1. The vertical projection of the *exterior wall* is less than 3 feet (914 mm) horizontally from the vertical projection of the nearest edge of the adjacent or adjoining *structure* or *premises*.
2. The portions of the *exterior walls* of the *story* are less than 12 feet (3658 mm) above the level of the roof of the adjacent or adjoining *structure* or the grade of the adjacent or adjoining *premises*.

Exceptions:

1. When a registered architect or engineer has certified that the adjacent roof assembly and the entire length and span of its supporting elements have a *fire-resistance rating* of not less than 1 hour, openings shall be allowed in the portions of those *exterior walls* that are more than 3 feet (914 mm) above the level of the roof. The maximum area of openings allowed under this exception shall be 45 percent of the area of such portions of the *exterior wall*.
 - 1.1. Where there are skylights or other unprotected openings in the roof of the adjacent exposing *building* that are less than 10 feet (3048 mm) from the vertical projection of the *exterior wall* of the opposing exposed *building*, the percentage of openings allowed under Section 705.8.7.2.2, Exception 1, shall be reduced to the following percentages of the exterior wall of the exposed *building*:
 - a. Zero feet up to 3 feet (0 mm up to 914 mm) from roof opening to wall: 0 percent.
 - b. Three feet up to 5 feet (914 mm up to 1524 mm) from roof opening to wall: 15 percent.
 - c. Five feet up to 10 feet (1524 mm up to 3048 mm) from roof opening to wall: 25 percent.

2. When a registered professional engineer has submitted a written report of inspection certifying that the adjacent *building* is protected throughout with an automatic fire sprinkler system conforming to Section 903.3, openings shall be allowed in the portions of the *exterior walls* that are more than 3 feet (914 mm) above the level of the roof. The maximum area of openings allowed under this exception shall be 45 percent of the area of such portions of the *exterior wall*.

705.8.7.3.2 Greater than or equal to 3 feet horizontally. In those portions of the *exterior walls* of a *story* that are 3 feet (914 mm) or greater horizontally from the vertical projection of the nearest edge of the adjacent *structure* or *premises*, and less than 15 feet (4572 mm) above the level of the roof of the adjacent *structure* or above the grade of the adjacent *premises*, a maximum area of openings of 45 percent of such portions of the *exterior wall*, calculated *story* by *story* and for each wall face, shall be allowed, where any one of the following conditions occur:

1. The openings are protected by opening protectives having a *fire-protection rating* of not less than $\frac{3}{4}$ hour.
2. The roof assembly of the adjacent exposing *building* or *structure*, and the entire length and span of its supporting elements, have a *fire-resistance rating* of not less than 1 hour for a minimum distance of 10 feet (3048 mm) from the vertical projection of the exposed *exterior wall*.

Exception: Where there are skylights or other unprotected openings in the roof of the adjacent exposing *building* that are less than 10 feet (3048 mm) from the vertical projection of the *exterior wall* of the exposed building, the percentage of openings allowed under Item 2 of this section shall be reduced to the following percentages:

1. Zero feet up to 3 feet (0 mm up to 914 mm) from roof opening to wall: 0 percent.
2. Three feet up to 5 feet (914 mm up to 1524 mm) from roof opening to wall: 15 percent.
3. Five feet up to 10 feet (1524 mm up to 3048 mm) from roof opening to wall: 25 percent.

705.8.7.4 Other allowable openings. In portions of the *exterior walls* of any *story*, other than those specified in Sections 705.8.7.1 through 705.8.7.3, openings up to the maximum of 45 percent of those portions of the *exterior wall*, calculated *story* by *story* and for each wall face, shall be authorized. Openings in compliance with Table 705.8 shall also be authorized.

705.8.7.5 Required opening protection. Where openings are authorized by Sections 705.8.7.1 through

705.8.7.4, such openings shall be protected as required by Sections 705.8.7.1 through 705.8.7.4, and window openings shall be protected by tempered, wired, or laminated glass, installed in compliance with Section 716.6. Mechanical and door openings shall be protected in compliance with Section 716.5 or 717.5.6.

705.8.7.6 Owner's responsibility. The owner of the *building* where openings are authorized pursuant to Sections 705.8.7.1 through 705.8.7.5 is responsible for making any modifications in the openings, the *exterior wall*, or appurtenant protective systems necessary to maintain the *building's* compliance with this code, whenever changes occur in the exterior envelope of any *building* or *premises* within a distance of 15 feet (4572 mm) or less of that *exterior wall* that render the openings no longer compliant with this code. The owner of the *building* with the resulting noncompliant openings shall complete all actions required to make the openings compliant with this code, as determined by the *code official*, including but not limited to: closing of openings, upgrading of opening protectives, and removal or extension of parts of the required sprinkler system protecting the openings.

705.8.7.7 Abatement of unsafe conditions. If the owner of a *building* or *structure* where any openings in *exterior walls* were allowed pursuant to Sections 705.8.7.1 through 705.8.7.6 fails to maintain in working order the protective systems required, or fails to proceed to make any changes required by the *code official* under Section 705.8.7.5, the *code official* is authorized to cause the necessary work to be done, in the interest of the safety and welfare of the public, in accordance with DC Official Code §§ 6-801 *et seq.* (2018 Repl.) and any other applicable laws and regulations. The cost of work shall become a lien against the property of the offending owner, to be recovered by the District of Columbia through appropriate action.

705.8.7.8 Required covenants. Prior to issuance of a building permit authorizing work that includes openings authorized under Sections 705.8.7.1 through 705.8.7.7, the applicant shall execute and record a covenant in accordance with the requirements of Section 106.2.19 and Section 120, as applicable, to ensure that compliance with the minimum requirements of Sections 705.8.7.1 through 705.8.7.7 will be maintained for as long as the openings shall exist, and that the responsibility to maintain this compliance will be conveyed to any future owner of the *building* or holder of an interest therein.

705.9 Joints. Joints made in or between *exterior walls* required by this section to have a *fire-resistance rating* shall comply with Section 715.

Exception: Joints in *exterior walls* that are permitted to have unprotected openings.

705.9.1 Voids. The void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly shall be protected in accordance with Section 715.4.

705.10 Ducts and air transfer openings. Penetrations by air ducts and air transfer openings in fire-resistance-rated *exterior walls* required to have protected openings shall comply with Section 717.

Exception: Foundation vents installed in accordance with this code are permitted.

705.11 Parapets. Parapets shall be provided on *exterior walls* of buildings.

Exceptions: A parapet need not be provided on an *exterior wall* where any of the following conditions exist:

1. The wall is not required to be fire-resistance rated in accordance with Table 602 because of *fire separation distance*.
2. The building has an area of not more than 1,000 square feet (93 m²) on any floor.
3. Walls that terminate at roofs of not less than 2-hour fire-resistance-rated construction or where the roof, including the deck or slab and supporting construction, is constructed entirely of noncombustible materials.
4. One-hour fire-resistance-rated *exterior walls* that terminate at the underside of the roof sheathing, deck or slab, provided:
 - 4.1. Where the roof/ceiling framing elements are parallel to the walls, such framing and elements supporting such framing shall not be of less than 1-hour fire-resistance-rated construction for a width of 4 feet (1220 mm) for Groups R and U and 10 feet (3048 mm) for other occupancies, measured from the interior side of the wall.
 - 4.2. Where roof/ceiling framing elements are not parallel to the wall, the entire span of such framing and elements supporting such framing shall not be of less than 1-hour fire-resistance-rated construction.
 - 4.3. Openings in the roof shall not be located within 5 feet (1524 mm) of the 1-hour fire-resistance-rated *exterior wall* for Groups R and U and 10 feet (3048 mm) for other occupancies, measured from the interior side of the wall.
 - 4.4. The entire building shall be provided with not less than a Class B roof covering.
5. In Groups R-2 and R-3 where the entire building is provided with a Class C roof covering, the *exterior wall* shall be permitted to terminate at the underside of the roof sheathing or deck in Type III, IV and V construction, provided one or both of the following criteria is met:
 - 5.1. The roof sheathing or deck is constructed of *approved* noncombustible materials or of *fire-retardant-treated wood* for a distance of 4 feet (1220 mm).

- 5.2. The roof is protected with 0.625-inch (16 mm) Type X gypsum board directly beneath the underside of the roof sheathing or deck, supported by not less than nominal 2-inch (51 mm) ledgers attached to the sides of the roof framing members for a minimum distance of 4 feet (1220 mm).

6. Where the wall is permitted to have not less than 25 percent of the *exterior wall* areas containing unprotected openings based on *fire separation distance* as determined in accordance with Section 705.8.

705.11.1 Parapet construction. Parapets shall have the same *fire-resistance rating* as that required for the supporting wall, and on any side adjacent to a roof surface, shall have noncombustible faces for the uppermost 18 inches (457 mm), including counterflashing and coping materials. The height of the parapet shall be not less than 30 inches (762 mm) above the point where the roof surface and the wall intersect. Where the roof slopes toward a parapet at a slope greater than two units vertical in 12 units horizontal (16.7-percent slope), the parapet shall extend to the same height as any portion of the roof within a *fire separation distance* where protection of wall openings is required, but in no case shall the height be less than 30 inches (762 mm).

SECTION 706 FIRE WALLS

706.1 General. Each portion of a *building* separated by one or more *fire walls* that comply with the provisions of this section shall be considered a separate *building*. The extent and location of such *fire walls* shall provide a complete separation. Where a *fire wall* separates occupancies that are required to be separated by a *fire barrier wall*, the most restrictive requirements of each separation shall apply.

706.1.1 Party walls. Any wall that straddles, or is in close proximity to, a *lot line*, which is used for structural support by two or more adjoining *buildings* or *structures* shall be constructed as a *fire wall* in accordance with Section 706. Such walls shall be constructed without openings and shall create separate *buildings*.

Exceptions:

1. Openings allowed pursuant to Section 705.8.7, provided that the *owners* of the adjacent *buildings* shall provide written authorization for such openings to each other and both *buildings* are subject to the covenant required by Section 705.8.7.8.
2. Openings in a party wall separating an *anchor building* and a *covered* or *open mall building* shall be in accordance with Section 402.4.2.2.

706.2 Structural stability. *Fire walls* shall be designed and constructed to allow collapse of the structure on either side without collapse of the wall under fire conditions. *Fire walls* designed and constructed in accordance with NFPA 221 shall be deemed to comply with this section.

706.3 Materials. *Fire walls* shall be of any *approved* non-combustible materials.

Exception: Buildings of Type V construction.

706.4 Fire-resistance rating. *Fire walls* shall have a *fire-resistance rating* of not less than that required by Table 706.4.

TABLE 706.4
FIRE WALL FIRE-RESISTANCE RATINGS

| GROUP | FIRE-RESISTANCE RATING (hours) |
|-------------------------------------|--------------------------------|
| A, B, E, H-4, I, R-1, R-2, U | 3 ^a |
| F-1, H-3 ^b , H-5, M, S-1 | 3 |
| H-1, H-2 | 4 ^b |
| F-2, S-2, R-3, R-4 | 2 |

a. In Type II or V construction, walls shall be permitted to have a 2-hour *fire-resistance rating*.

b. For Group H-1, H-2 or H-3 buildings, also see Sections 415.7 and 415.8.

706.5 Horizontal continuity. *Fire walls* shall be continuous from *exterior wall* to *exterior wall* and shall extend not less than 18 inches (457 mm) beyond the exterior surface of *exterior walls*.

Exceptions:

1. *Fire walls* shall be permitted to terminate at the interior surface of combustible exterior sheathing or siding provided the *exterior wall* has a *fire-resistance rating* of not less than 1 hour for a horizontal distance of not less than 4 feet (1220 mm) on both sides of the *fire wall*. Openings within such *exterior walls* shall be protected by opening protectives having a *fire protection rating* of not less than $\frac{3}{4}$ hour.
2. *Fire walls* shall be permitted to terminate at the interior surface of noncombustible exterior sheathing, exterior siding or other noncombustible exterior finishes provided the sheathing, siding or other exterior noncombustible finish extends a horizontal distance of not less than 4 feet (1220 mm) on both sides of the *fire wall*.
3. *Fire walls* shall be permitted to terminate at the interior surface of noncombustible exterior sheathing where the building on each side of the *fire wall* is protected by an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2.

706.5.1 Exterior walls. Where the *fire wall* intersects *exterior walls*, the *fire-resistance rating* and opening protection of the *exterior walls* shall comply with one of the following:

1. The *exterior walls* on both sides of the *fire wall* shall have a 1-hour *fire-resistance rating* with $\frac{3}{4}$ -hour protection where opening protection is required by Section 705.8. The *fire-resistance rating* of the *exterior wall* shall extend not less than 4 feet (1220 mm) on each side of the intersection of the *fire wall* to *exterior wall*. *Exterior wall* intersections at *fire*

walls that form an angle equal to or greater than 180 degrees (3.14 rad) do not need *exterior wall* protection.

2. Buildings or spaces on both sides of the intersecting *fire wall* shall assume to have an imaginary *lot line* at the *fire wall* and extending beyond the exterior of the *fire wall*. The location of the assumed line in relation to the *exterior walls* and the *fire wall* shall be such that the *exterior wall* and opening protection meet the requirements set forth in Sections 705.5 and 705.8. Such protection is not required for *exterior walls* terminating at *fire walls* that form an angle equal to or greater than 180 degrees (3.14 rad).

706.5.2 Horizontal projecting elements. *Fire walls* shall extend to the outer edge of horizontal projecting elements such as balconies, roof overhangs, canopies, marquees and similar projections that are within 4 feet (1220 mm) of the *fire wall*.

Exceptions:

1. Horizontal projecting elements without concealed spaces, provided the *exterior wall* behind and below the projecting element has not less than 1-hour fire-resistance-rated construction for a distance not less than the depth of the projecting element on both sides of the *fire wall*. Openings within such *exterior walls* shall be protected by opening protectives having a *fire protection rating* of not less than $\frac{3}{4}$ hour.
2. Noncombustible horizontal projecting elements with concealed spaces, provided a minimum 1-hour fire-resistance-rated wall extends through the concealed space. The projecting element shall be separated from the building by not less than 1-hour fire-resistance-rated construction for a distance on each side of the *fire wall* equal to the depth of the projecting element. The wall is not required to extend under the projecting element where the building *exterior wall* is not less than 1-hour fire-resistance rated for a distance on each side of the *fire wall* equal to the depth of the projecting element. Openings within such *exterior walls* shall be protected by opening protectives having a *fire protection rating* of not less than $\frac{3}{4}$ hour.
3. For combustible horizontal projecting elements with concealed spaces, the *fire wall* need only extend through the concealed space to the outer edges of the projecting elements. The *exterior wall* behind and below the projecting element shall be of not less than 1-hour fire-resistance-rated construction for a distance not less than the depth of the projecting elements on both sides of the *fire wall*. Openings within such *exterior walls* shall be protected by opening protectives having a fire-protection rating of not less than $\frac{3}{4}$ hour.

706.6 Vertical continuity. *Fire walls* shall extend from the foundation to a termination point not less than 30 inches (762 mm) above both adjacent roofs.

Exceptions:

1. Stepped buildings in accordance with Section 706.6.1.
2. Two-hour fire-resistance-rated walls shall be permitted to terminate at the underside of the roof sheathing, deck or slab, provided:
 - 2.1. The lower roof assembly within 4 feet (1220 mm) of the wall has not less than a 1-hour *fire-resistance rating* and the entire length and span of supporting elements for the rated roof assembly has a *fire-resistance rating* of not less than 1 hour.
 - 2.2. Openings in the roof shall not be located within 4 feet (1220 mm) of the *fire wall*.
 - 2.3. Each building shall be provided with not less than a Class B roof covering.
3. Walls shall be permitted to terminate at the underside of noncombustible roof sheathing, deck or slabs where both buildings are provided with not less than a Class B roof covering. Openings in the roof shall not be located within 4 feet (1220 mm) of the *fire wall*.
4. In buildings of Type III, IV and V construction, walls shall be permitted to terminate at the underside of combustible roof sheathing or decks, provided:
 - 4.1. There are no openings in the roof within 4 feet (1220 mm) of the *fire wall*,
 - 4.2. The roof is covered with a minimum Class B roof covering, and
 - 4.3. The roof sheathing or deck is constructed of *fire-retardant-treated wood* for a distance of 4 feet (1220 mm) on both sides of the wall or the roof is protected with $\frac{5}{8}$ -inch (15.9 mm) Type X gypsum board directly beneath the underside of the roof sheathing or deck, supported by not less than 2-inch (51 mm) nominal ledgers attached to the sides of the roof framing members for a distance of not less than 4 feet (1220 mm) on both sides of the *fire wall*.
5. In buildings designed in accordance with Section 510.2, *fire walls* located above the 3-hour *horizontal assembly* required by Section 510.2, Item 1 shall be permitted to extend from the top of this *horizontal assembly*.
6. Buildings with sloped roofs in accordance with Section 706.6.2.

706.6.1 Stepped buildings. Where a *fire wall* serves as an *exterior wall* for a building and separates buildings having different roof levels, such wall shall terminate at a point not less than 30 inches (762 mm) above the lower roof

level, provided the *exterior wall* for a height of 15 feet (4572 mm) above the lower roof is not less than 1-hour fire-resistance-rated construction from both sides with openings protected by fire assemblies having a *fire protection rating* of not less than $\frac{3}{4}$ hour.

Exception: Where the *fire wall* terminates at the underside of the roof sheathing, deck or slab of the lower roof, provided:

1. The lower roof assembly within 10 feet (3048 mm) of the wall has not less than a 1-hour *fire-resistance rating* and the entire length and span of supporting elements for the rated roof assembly has a *fire-resistance rating* of not less than 1 hour.
2. Openings in the lower roof shall not be located within 10 feet (3048 mm) of the *fire wall*.

706.6.2 Buildings with sloped roofs. Where a *fire wall* serves as an interior wall for a building, and the roof on one side or both sides of the fire wall slopes toward the fire wall at a slope greater than two units vertical in 12 units horizontal (2:12), the *fire wall* shall extend to a height equal to the height of the roof located 4 feet (1219 mm) from the *fire wall* plus 30 inches (762 mm). In no case shall the extension of the fire wall be less than 30 inches (762 mm).

706.7 Combustible framing in fire walls. Adjacent combustible members entering into a concrete or masonry *fire wall* from opposite sides shall not have less than a 4-inch (102 mm) distance between embedded ends. Where combustible members frame into hollow walls or walls of hollow units, hollow spaces shall be solidly filled for the full thickness of the wall and for a distance not less than 4 inches (102 mm) above, below and between the structural members, with noncombustible materials *approved* for fireblocking.

706.8 Openings. Each opening through a *fire wall* shall be protected in accordance with Section 716.5 and shall not exceed 156 square feet (15 m²) in total area. The aggregate width of openings at any floor level shall not exceed 25 percent of the length of the wall.

Exceptions:

1. Openings are not permitted in party walls constructed in accordance with Section 706.1.1, unless authorized by and subject to the limitations of Section 705.8.7.
2. Openings are allowed pursuant to Section 705.8.7 where a *fire wall* can be replaced by two *exterior walls*.
3. Openings shall not be limited to 156 square feet (15 m²) where both *buildings* are equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1.

706.9 Penetrations. Penetrations of *fire walls* shall comply with Section 714.

706.10 Joints. Joints made in or between *fire walls* shall comply with Section 715.

706.11 Ducts and air transfer openings. Ducts and air transfer openings shall not penetrate *fire walls*.

Exception: Penetrations by ducts and air transfer openings of *fire walls* that are not on a *lot line* shall be allowed provided the penetrations comply with Section 717. The size and aggregate width of all openings shall not exceed the limitations of Section 706.8.

SECTION 707 FIRE BARRIERS

707.1 General. *Fire barriers* installed as required elsewhere in this code or the *Fire Code* shall comply with this section.

707.2 Materials. *Fire barriers* shall be of materials permitted by the building type of construction.

707.3 Fire-resistance rating. The *fire-resistance rating* of *fire barriers* shall comply with this section.

707.3.1 Shaft enclosures. The *fire-resistance rating* of the *fire barrier* separating building areas from a shaft shall comply with Section 713.4.

707.3.2 Interior exit stairway and ramp construction. The *fire-resistance rating* of the *fire barrier* separating building areas from an *interior exit stairway* or *ramp* shall comply with Section 1023.1.

707.3.3 Enclosures for exit access stairways. The *fire-resistance rating* of the *fire barrier* separating building areas from an *exit access stairway* or *ramp* shall comply with Section 713.4.

707.3.4 Exit passageway. The *fire-resistance rating* of the *fire barrier* separating building areas from an *exit passageway* shall comply with Section 1024.3.

707.3.5 Horizontal exit. The *fire-resistance rating* of the separation between building areas connected by a horizontal *exit* shall comply with Section 1026.1.

707.3.6 Atriums. The *fire-resistance rating* of the *fire barrier* separating atriums shall comply with Section 404.6.

707.3.7 Incidental uses. The *fire barrier* separating incidental uses from other spaces in the building shall have a *fire-resistance rating* of not less than that indicated in Table 509.

707.3.8 Control areas. *Fire barriers* separating *control areas* shall have a *fire-resistance rating* of not less than that required in Section 414.2.4.

707.3.9 Separated occupancies. Where the provisions of Section 508.4 are applicable, the *fire barrier* separating mixed occupancies shall have a *fire-resistance rating* of not less than that indicated in Table 508.4 based on the occupancies being separated.

707.3.10 Fire areas. The *fire barriers* or *horizontal assemblies*, or both, separating a single occupancy into different *fire areas* shall have a *fire-resistance rating* of not less than that indicated in Table 707.3.10. The *fire barriers* or *horizontal assemblies*, or both, separating *fire areas* of mixed occupancies shall have a *fire-resistance*

rating of not less than the highest value indicated in Table 707.3.10 for the occupancies under consideration.

**TABLE 707.3.10
FIRE-RESISTANCE RATING REQUIREMENTS FOR
FIRE BARRIER ASSEMBLIES OR HORIZONTAL
ASSEMBLIES BETWEEN FIRE AREAS**

| OCCUPANCY GROUP | FIRE-RESISTANCE RATING (hours) |
|---|--------------------------------|
| H-1, H-2 | 4 |
| F-1, H-3, S-1 | 3 |
| A, B, E, F-2, H-4, H-5, I, M, R, S-2 | 2 |
| U | 1 |

707.4 Exterior walls. Where exterior walls serve as a part of a required fire-resistance-rated shaft or stairway or ramp enclosure, or separation, such walls shall comply with the requirements of Section 705 for exterior walls and the fire-resistance-rated enclosure or separation requirements shall not apply.

Exception: Exterior walls required to be fire-resistance rated in accordance with Section 1021 for exterior egress balconies, Section 1023.7 for interior exit stairways and ramps and Section 1027.6 for exterior exit stairways and ramp.

707.5 Continuity. *Fire barriers* shall extend from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, slab or deck above and shall be securely attached thereto. Such *fire barriers* shall be continuous through concealed space, such as the space above a suspended ceiling. Joints and voids at intersections shall comply with Sections 707.8 and 707.9

Exceptions:

1. Shaft enclosures shall be permitted to terminate at a top enclosure complying with Section 713.12.
2. *Interior exit stairway* and *ramp* enclosures required by Section 1023 and *exit access stairway* and *ramp* enclosures required by Section 1019 shall be permitted to terminate at a top enclosure complying with Section 713.12.

707.5.1 Supporting construction. The supporting construction for a *fire barrier* shall be protected to afford the required *fire-resistance rating* of the *fire barrier* supported. Hollow vertical spaces within a *fire barrier* shall be fireblocked in accordance with Section 718.2 at every floor level.

Exceptions:

1. The maximum required *fire-resistance rating* for assemblies supporting *fire barriers* separating tank storage as provided for in Section 415.9.1.2 shall be 2 hours, but not less than required by Table 601 for the building construction type.
2. Supporting construction for 1-hour *fire barriers* required by Table 509 in buildings of Type IIB, IIIB and VB construction is not required to be *fire-resistance rated* unless required by other sections of this code.

707.6 Openings. Openings in a *fire barrier* shall be protected in accordance with Section 716. Openings shall be limited to a maximum aggregate width of 25 percent of the length of the wall, and the maximum area of any single opening shall not exceed 156 square feet (15 m²). Openings in enclosures for *exit access stairways* and *ramps*, *interior exit stairways* and *ramps* and *exit passageways* shall also comply with Sections 1019, 1023.4 and 1024.5, respectively.

Exceptions:

1. Openings shall not be limited to 156 square feet (15 m²) where adjoining floor areas are equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
2. Openings shall not be limited to 156 square feet (15 m²) or an aggregate width of 25 percent of the length of the wall where the opening protective is a fire door serving enclosures for exit access stairways and ramps, and interior exit stairways and ramps.
3. Openings shall not be limited to 156 square feet (15 m²) or an aggregate width of 25 percent of the length of the wall where the opening protective has been tested in accordance with ASTM E119 or UL 263 and has a minimum *fire-resistance rating* not less than the *fire-resistance rating* of the wall.
4. Fire window assemblies permitted in atrium separation walls shall not be limited to a maximum aggregate width of 25 percent of the length of the wall.
5. Openings shall not be limited to 156 square feet (15 m²) or an aggregate width of 25 percent of the length of the wall where the opening protective is a fire door assembly in a *fire barrier* separating an enclosure for *exit access* stairways and ramps, and interior exit stairways and ramps from an exit passageway in accordance with Section 1023.3.1.

707.7 Penetrations. Penetrations of *fire barriers* shall comply with Section 714.

707.7.1 Prohibited penetrations. Penetrations into enclosures for *exit access stairways* and *ramps*, *interior exit stairways* and *ramps*, and *exit passageways* shall be allowed only where permitted by Sections 1019, 1023.5 and 1024.6, respectively.

707.8 Joints. Joints made in or between *fire barriers*, and joints made at the intersection of *fire barriers* with underside of a fire-resistance-rated floor or roof sheathing, slab or deck above, and the exterior vertical wall intersection shall comply with Section 715.

707.9 Voids at intersections. The voids created at the intersection of a *fire barrier* and a nonfire-resistance-rated roof assembly or a nonfire-resistance-rated exterior wall assembly shall be filled. An approved material or system shall be used to fill the void, and shall be securely installed in or on the intersection for its entire length so as not to dislodge, loosen or otherwise impair its ability to accommodate expected building movements and to retard the passage of fire and hot gases.

707.10 Ducts and air transfer openings. Penetrations in a *fire barrier* by ducts and air transfer openings shall comply with Section 717.

SECTION 708 FIRE PARTITIONS

708.1 General. The following wall assemblies shall comply with this section.

1. Separation walls as required by Section 420.2 for Groups I-1, R-1, R-2 and R-3.
2. Walls separating tenant spaces in *covered and open mall buildings* as required by Section 402.4.2.1.
3. Corridor walls as required by Section 1020.1.
4. Elevator lobby separation as required by Section 3006.2.
5. Egress balconies as required by Section 1019.2

708.2 Materials. The walls shall be of materials permitted by the building type of construction.

708.3 Fire-resistance rating. Fire partitions shall have a *fire-resistance rating* of not less than 1 hour.

Exceptions:

1. Corridor walls permitted to have a 1/2-hour *fire-resistance rating* by Table 1020.1.
2. *Dwelling unit* and *sleeping unit* separations in buildings of Type IIB, IIIB and VB construction shall have *fire-resistance ratings* of not less than 1/2 hour in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

708.4 Continuity. Fire partitions shall extend from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, slab or deck above or to the fire-resistance-rated floor/ceiling or roof/ceiling assembly above, and shall be securely attached thereto. In combustible construction where the *fire partitions* are not required to be continuous to the sheathing, deck or slab, the space between the ceiling and the sheathing, deck or slab above shall be fire-blocked or draftstopped in accordance with Sections 718.2 and 718.3 at the partition line. The supporting construction shall be protected to afford the required *fire-resistance rating* of the wall supported, except for walls separating tenant spaces in *covered and open mall buildings*, walls separating *dwelling units*, walls separating *sleeping units* and *corridor walls*, in buildings of Type IIB, IIIB and VB construction.

Exceptions:

1. The wall need not be extended into the crawl space below where the floor above the crawl space has a minimum 1-hour *fire-resistance rating*.
2. Where the room-side fire-resistance-rated membrane of the *corridor* is carried through to the underside of the floor or roof sheathing, deck or slab of a fire-resistance-rated floor or roof above, the ceiling of the *corridor* shall be permitted to be protected by

the use of ceiling materials as required for a 1-hour fire-resistance-rated floor or roof system.

3. Where the *corridor* ceiling is constructed as required for the *corridor* walls, the walls shall be permitted to terminate at the upper membrane of such ceiling assembly.
4. The fire partitions separating tenant spaces in a *covered or open mall building*, complying with Section 402.4.2.1, are not required to extend beyond the underside of a ceiling that is not part of a fire-resistance-rated assembly. A wall is not required in *attic* or ceiling spaces above tenant separation walls.
5. Attic fireblocking or draftstopping is not required at the partition line in Group R-2 buildings that do not exceed four *stories above grade plane*, provided the *attic* space is subdivided by draftstopping into areas not exceeding 3,000 square feet (279 m²) or above every two *dwelling units*, whichever is smaller.
6. Fireblocking or draftstopping is not required at the partition line in buildings equipped with an *automatic sprinkler system* installed throughout in accordance with Section 903.3.1.1 or 903.3.1.2, provided that automatic sprinklers are installed in combustible floor/ceiling and roof/ceiling spaces.

708.5 Exterior walls. Where *exterior walls* serve as a part of a required fire-resistance-rated separation, such walls shall comply with the requirements of Section 705 for *exterior walls*, and the fire-resistance-rated separation requirements shall not apply.

Exception: Exterior walls required to be fire-resistance rated in accordance with Section 1021.2 for exterior egress balconies, Section 1023.7 for interior exit stairways and ramps and Section 1027.6 for exterior exit stairways and ramps.

708.6 Openings. Openings in a *fire partition* shall be protected in accordance with Section 716.

708.7 Penetrations. Penetrations of *fire partitions* shall comply with Section 714.

708.8 Joints. Joints made in or between *fire partitions* shall comply with Section 715.

708.9 Ducts and air transfer openings. Penetrations in a *fire partition* by ducts and air transfer openings shall comply with Section 717.

SECTION 709 SMOKE BARRIERS

709.1 General. Vertical and horizontal *smoke barriers* shall comply with this section.

709.2 Materials. *Smoke barriers* shall be of materials permitted by the building type of construction.

709.3 Fire-resistance rating. A 1-hour *fire-resistance rating* is required for *smoke barriers*.

Exception: *Smoke barriers* constructed of minimum 0.10-inch-thick (2.5 mm) steel in Group I-3 buildings.

709.4 Continuity. *Smoke barriers* shall form an effective membrane continuous from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, deck or slab above, including continuity through concealed spaces, such as those found above suspended ceilings, and interstitial structural and mechanical spaces. The supporting construction shall be protected to afford the required *fire-resistance rating* of the wall or floor supported in buildings of other than Type IIB, IIIB or VB construction. *Smoke barrier* walls used to separate smoke compartments shall comply with Section 709.4.1. *Smoke-barrier* walls used to enclose areas of refuge in accordance with Section 1009.6.4 or to enclose elevator lobbies in accordance with Section 405.4.3, 3007.6.2, or 3008.6.2 shall comply with Section 709.4.2.

Exception: *Smoke-barrier* walls are not required in interstitial spaces where such spaces are designed and constructed with ceilings or *exterior walls* that provide resistance to the passage of fire and smoke equivalent to that provided by the *smoke-barrier* walls.

709.4.1 Smoke-barrier walls separating smoke compartments. *Smoke-barrier* walls used to separate smoke compartments shall form an effective membrane continuous from outside wall to outside wall.

709.4.2 Smoke-barrier walls enclosing areas of refuge or elevator lobbies. *Smoke-barrier* walls used to enclose areas of refuge in accordance with Section 1009.6.4, or to enclose elevator lobbies in accordance with Section 405.4.3, 3007.6.2, or 3008.6.2, shall form an effective membrane enclosure that terminates at a *fire barrier* wall having a level of *fire protection rating* not less than 1 hour, another *smoke barrier* wall or an outside wall. A smoke and draft control door assembly as specified in Section 716.5.3.1 shall not be required at each elevator hoistway door opening or at each exit doorway between an area of refuge and the exit enclosure.

709.5 Openings. Openings in a *smoke barrier* shall be protected in accordance with Section 716.

Exceptions:

1. In Group I-1 Condition 2, Group I-2 and *ambulatory care facilities*, where a pair of opposite-swinging doors are installed across a corridor in accordance with Section 709.5.1, the doors shall not be required to be protected in accordance with Section 716. The doors shall be close fitting within operational tolerances, and shall not have a center mullion or undercuts in excess of $\frac{3}{4}$ inch (19.1 mm), louvers or grilles. The doors shall have head and jamb stops, and astragals or rabbets at meeting edges. Where permitted by the door manufacturer's listing, positive-latching devices are not required.
2. In Group I-1 Condition 2, Group I-2 and *ambulatory care facilities*, horizontal sliding doors installed in accordance with Section 1010.1.4.3 and protected in accordance with Section 716.

709.5.1 Group I-2 and ambulatory care facilities. In Group I-2 and *ambulatory care facilities*, where doors are

installed across a corridor, the doors shall be automatic-closing by smoke detection in accordance with Section 716.5.9.3 and shall have a vision panel with fire-protection-rated glazing materials in fire-protection-rated frames, the area of which shall not exceed that tested.

709.6 Penetrations. Penetrations of *smoke barriers* shall comply with Section 714.

709.7 Joints. Joints made in or between *smoke barriers* shall comply with Section 715.

709.8 Ducts and air transfer openings. Penetrations in a *smoke barrier* by ducts and air transfer openings shall comply with Section 717.

SECTION 710 SMOKE PARTITIONS

710.1 General. Smoke partitions installed as required elsewhere in the code shall comply with this section.

710.2 Materials. The walls shall be of materials permitted by the building type of construction.

710.3 Fire-resistance rating. Unless required elsewhere in the code, smoke partitions are not required to have a *fire-resistance rating*.

710.4 Continuity. Smoke partitions shall extend from the top of the foundation or floor below to the underside of the floor or roof sheathing, deck or slab above or to the underside of the ceiling above where the ceiling membrane is constructed to limit the transfer of smoke.

710.5 Openings. Openings in smoke partitions shall comply with Sections 710.5.1 and 710.5.2.

710.5.1 Windows. Windows in smoke partitions shall be sealed to resist the free passage of smoke or be automatic-closing upon detection of smoke.

710.5.2 Doors. Doors in smoke partitions shall comply with Sections 710.5.2.1 through 710.5.2.3.

710.5.2.1 Louvers. Doors in smoke partitions shall not include louvers.

710.5.2.2 Smoke and draft control doors. Where required elsewhere in the code, doors in smoke partitions shall meet the requirements for a smoke and draft control door assembly tested in accordance with UL 1784. The air leakage rate of the door assembly shall not exceed 3.0 cubic feet per minute per square foot [$0.015424 \text{ m}^3/(\text{s} \cdot \text{m}^2)$] of door opening at 0.10 inch (24.9 Pa) of water for both the ambient temperature test and the elevated temperature exposure test. Installation of smoke doors shall be in accordance with NFPA 105.

710.5.2.2.1 Smoke and draft control door labeling. Smoke and draft control doors complying only with UL 1784 shall be permitted to show the letter "S" on the manufacturer's labeling.

710.5.2.3 Self- or automatic-closing doors. Where required elsewhere in the code, doors in smoke partitions shall be self- or automatic-closing by smoke detection in accordance with Section 716.5.9.3.

710.6 Penetrations. The space around penetrating items shall be filled with an *approved* material to limit the free passage of smoke.

710.7 Joints. Joints shall be filled with an *approved* material to limit the free passage of smoke.

710.8 Ducts and air transfer openings. The space around a duct penetrating a smoke partition shall be filled with an *approved* material to limit the free passage of smoke. Air transfer openings in smoke partitions shall be provided with a *smoke damper* complying with Section 717.3.2.2.

Exception: Where the installation of a *smoke damper* will interfere with the operation of a required smoke control system in accordance with Section 909, *approved* alternative protection shall be utilized.

SECTION 711 FLOOR AND ROOF ASSEMBLIES

711.1 General. *Horizontal assemblies* shall comply with Section 711.2. Nonfire-resistance-rated floor and roof assemblies shall comply with Section 711.3.

711.2 Horizontal assemblies. *Horizontal assemblies* shall comply with Sections 711.2.1 through 711.2.6.

711.2.1 Materials. Assemblies shall be of materials permitted by the building type of construction.

711.2.2 Continuity. Assemblies shall be continuous without vertical openings, except as permitted by this section and Section 712.

711.2.3 Supporting construction. The supporting construction shall be protected to afford the required *fire-resistance rating* of the *horizontal assembly* supported.

Exception: In buildings of Type IIB, IIIB or VB construction, the construction supporting the *horizontal assembly* is not required to be *fire-resistance rated* at the following:

1. *Horizontal assemblies* at the separations of incidental uses as specified by Table 509 provided the required *fire-resistance rating* does not exceed 1 hour.
2. *Horizontal assemblies* at the separations of *dwelling units* and *sleeping units* as required by Section 420.3.
3. *Horizontal assemblies* at *smoke barriers* constructed in accordance with Section 709.

711.2.4 Fire-resistance rating. The *fire-resistance rating* of *horizontal assemblies* shall comply with Sections 711.2.4.1 through 711.2.4.6 but shall be not less than that required by the building type of construction.

711.2.4.1 Separating mixed occupancies. Where the *horizontal assembly* separates mixed occupancies, the assembly shall have a *fire-resistance rating* of not less than that required by Section 508.4 based on the occupancies being separated.

711.2.4.2 Separating fire areas. Where the *horizontal assembly* separates a single occupancy into different

fire areas, the assembly shall have a *fire-resistance rating* of not less than that required by Section 707.3.10.

711.2.4.3 Dwelling units and sleeping units. *Horizontal assemblies* serving as dwelling or sleeping unit separations in accordance with Section 420.3 shall be not less than 1-hour *fire-resistance-rated* construction.

Exception: *Horizontal assemblies* separating *dwelling units* and *sleeping units* shall be not less than $\frac{1}{2}$ -hour *fire-resistance-rated* construction in a building of Type IIB, IIIB and VB construction, where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

711.2.4.4 Separating smoke compartments. Where the *horizontal assembly* is required to be a *smoke barrier*, the assembly shall comply with Section 709.

711.2.4.5 Separating incidental uses. Where the *horizontal assembly* separates incidental uses from the remainder of the building, the assembly shall have a *fire-resistance rating* of not less than that required by Section 509.

711.2.4.6 Other separations. Where a *horizontal assembly* is required by other sections of this code, the assembly shall have a *fire-resistance rating* of not less than that required by that section.

711.2.5 Ceiling panels. Where the weight of lay-in ceiling panels, used as part of *fire-resistance-rated* floor/ceiling or roof/ceiling assemblies, is not adequate to resist an upward force of 1 pound per square foot (48 Pa), wire or other *approved* devices shall be installed above the panels to prevent vertical displacement under such upward force.

711.2.6 Unusable space. In 1-hour *fire-resistance-rated* floor/ceiling assemblies, the ceiling membrane is not required to be installed over unusable crawl spaces. In 1-hour *fire-resistance-rated* roof assemblies, the floor membrane is not required to be installed where unusable *attic* space occurs above.

711.3 Nonfire-resistance-rated floor and roof assemblies. Nonfire-resistance-rated floor, floor/ceiling, roof and roof/ceiling assemblies shall comply with Sections 711.3.1 and 711.3.2.

711.3.1 Materials. Assemblies shall be of materials permitted by the building type of construction.

711.3.2 Continuity. Assemblies shall be continuous without vertical openings, except as permitted by Section 712.

SECTION 712 VERTICAL OPENINGS

712.1 General. Each vertical opening shall comply in accordance with one of the protection methods in Sections 712.1.1 through 712.1.16.

712.1.1 Shaft enclosures. Vertical openings contained entirely within a shaft enclosure complying with Section 713 shall be permitted.

712.1.2 Individual dwelling unit. Unconcealed vertical openings totally within an individual residential dwelling unit and connecting four stories or less shall be permitted.

712.1.3 Escalator openings. Where a building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, vertical openings for escalators shall be permitted where protected in accordance with Section 712.1.3.1 or 712.1.3.2.

712.1.3.1 Opening size. Protection by a draft curtain and closely spaced sprinklers in accordance with NFPA 13 shall be permitted where the area of the vertical opening between stories does not exceed twice the horizontal projected area of the escalator. In other than Groups B and M, this application is limited to openings that do not connect more than four stories.

712.1.3.2 Automatic shutters. Protection of the vertical opening by approved shutters at every penetrated floor shall be permitted in accordance with this section. The shutters shall be of noncombustible construction and have a *fire-resistance rating* of not less than 1.5 hours. The shutter shall be so constructed as to close immediately upon the actuation of a smoke detector installed in accordance with Section 907.3.1 and shall completely shut off the well opening. Escalators shall cease operation when the shutter begins to close. The shutter shall operate at a speed of not more than 30 feet per minute (152.4 mm/s) and shall be equipped with a sensitive leading edge to arrest its progress where in contact with any obstacle, and to continue its progress on release there from.

712.1.4 Penetrations. Penetrations, concealed and unconcealed, shall be permitted where protected in accordance with Section 714.

712.1.5 Joints. Joints shall be permitted where complying with Section 712.1.5.1 or 712.1.5.2, as applicable.

712.1.5.1 Joints in or between horizontal assemblies. Joints made in or between *horizontal assemblies* shall comply with Section 715. The void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly shall be permitted where protected in accordance with Section 715.4.

712.1.5.2 Joints in or between nonfire-resistance-rated floor assemblies. Joints in or between floor assemblies without a required *fire-resistance rating* shall be permitted where they comply with one of the following:

1. The joint shall be concealed within the cavity of a wall.
2. The joint shall be located above a ceiling.
3. The joint shall be sealed, treated or covered with an *approved* material or system to resist the free passage of flame and the products of combustion.

Exception: Joints meeting one of the exceptions listed in Section 715.1.

712.1.6 Ducts and air transfer openings. Penetrations by ducts and air transfer openings shall be protected in accor-

dance with Section 717. Grease ducts shall be protected in accordance with the *Mechanical Code*.

712.1.7 Atriums. In other than Group H occupancies, atriums complying with Section 404 shall be permitted.

712.1.8 Masonry chimney. Approved vertical openings for masonry chimneys shall be permitted where the annular space is fireblocked at each floor level in accordance with Section 718.2.5.

712.1.9 Two-story openings. In other than Groups I-2 and I-3, a vertical opening that is not used as one of the applications listed in this section shall be permitted if the opening complies with all of the items below:

1. Does not connect more than two stories.
2. Does not penetrate a horizontal assembly that separates fire areas or smoke barriers that separate smoke compartments.
3. Is not concealed within the construction of a wall or a floor/ceiling assembly.
4. Is not open to a corridor in Group I and R occupancies.
5. Is not open to a corridor on nonsprinklered floors.
6. Is separated from floor openings and air transfer openings serving other floors by construction conforming to required shaft enclosures.

712.1.10 Parking garages. Vertical openings in parking garages for automobile ramps, elevators and duct systems shall comply with Section 712.1.10.1, 712.1.10.2 or 712.1.10.3, as applicable.

712.1.10.1 Automobile ramps. Vertical openings for automobile ramps in open and enclosed parking garages shall be permitted where constructed in accordance with Sections 406.5 and 406.6, respectively.

712.1.10.2 Elevators. Vertical openings for elevator hoistways in open or enclosed parking garages that serve only the parking garage, and complying with Sections 406.5 and 406.6, respectively, shall be permitted.

712.1.10.3 Duct systems. Vertical openings for mechanical exhaust or supply duct systems in open or enclosed parking garages complying with Sections 406.5 and 406.6, respectively, shall be permitted to be unenclosed where such duct system is contained within and serves only the parking garage.

712.1.11 Mezzanine. Vertical openings between a mezzanine complying with Section 505 and the floor below shall be permitted.

712.1.12 Exit access stairways and ramps. Vertical openings containing *exit access stairways* or *ramps* in accordance with Section 1019 shall be permitted.

712.1.13 Openings. Vertical openings for floor fire doors and access doors shall be permitted where protected by Section 712.1.13.1 or 712.1.13.2.

712.1.13.1 Horizontal fire door assemblies. Horizontal *fire door* assemblies used to protect openings in fire-resistance-rated *horizontal assemblies* shall be tested in

accordance with NFPA 288, and shall achieve a *fire-resistance rating* not less than the assembly being penetrated. Horizontal *fire door* assemblies shall be labeled by an *approved agency*. The *label* shall be permanently affixed and shall specify the manufacturer, the test standard and the *fire-resistance rating*.

712.1.13.2 Access doors. Access doors shall be permitted in ceilings of fire-resistance-rated floor/ceiling and roof/ceiling assemblies, provided such doors are tested in accordance with ASTM E119 or UL 263 as horizontal assemblies and labeled by an approved agency for such purpose.

712.1.14 Group I-3. In Group I-3 occupancies, vertical openings shall be permitted in accordance with Section 408.5.

712.1.15 Skylights. Skylights and other penetrations through a *fire-resistance-rated* roof deck or slab are permitted to be unprotected, provided that the structural integrity of the *fire-resistance-rated* roof assembly is maintained. Unprotected skylights shall not be permitted in roof assemblies required to be *fire-resistance rated* in accordance with Section 705.8.6. The supporting construction shall be protected to afford the required *fire-resistance rating* of the *horizontal assembly* supported.

712.1.16 Openings otherwise permitted. Vertical openings shall be permitted where allowed by other sections of this code.

SECTION 713 SHAFT ENCLOSURES

713.1 General. The provisions of this section shall apply to shafts required to protect openings and penetrations through floor/ceiling and roof/ceiling assemblies. *Interior exit stairways* and *ramps* shall be enclosed in accordance with Section 1023.

713.2 Construction. Shaft enclosures shall be constructed as *fire barriers* in accordance with Section 707 or horizontal assemblies in accordance with Section 711, or both.

713.3 Materials. The shaft enclosure shall be of materials permitted by the building type of construction.

713.4 Fire-resistance rating. Shaft enclosures shall have a *fire-resistance rating* of not less than 2 hours where connecting four *stories* or more, and not less than 1 hour where connecting less than four *stories*. The number of *stories* connected by the shaft enclosure shall include any basements but not any *mezzanines*. Shaft enclosures shall have a *fire-resistance rating* not less than the floor assembly penetrated, but need not exceed 2 hours. Shaft enclosures shall meet the requirements of Section 703.2.1.

713.5 Continuity. Shaft enclosures shall be constructed as *fire barriers* in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both, and shall have continuity in accordance with Section 707.5 for *fire barriers* or Section 711.2.2 for *horizontal assemblies*, as applicable.

713.6 Exterior walls. Where *exterior walls* serve as a part of a required shaft enclosure, such walls shall comply with the requirements of Section 705 for *exterior walls* and the fire-resistance-rated enclosure requirements shall not apply.

Exception: Exterior walls required to be fire-resistance rated in accordance with Section 1021.2 for exterior egress balconies, Section 1023.7 for interior *exit* stairways and ramps and Section 1027.6 for exterior *exit* stairways and ramps.

713.7 Openings. Openings in a shaft enclosure shall be protected in accordance with Section 716 as required for *fire barriers*. Doors shall be self- or automatic-closing by smoke detection in accordance with Section 716.5.9.3.

713.7.1 Prohibited openings. Openings other than those necessary for the purpose of the shaft shall not be permitted in shaft enclosures.

713.8 Penetrations. Penetrations in a shaft enclosure shall be protected in accordance with Section 714 as required for *fire barriers*. Structural elements, such as beams or joists, where protected in accordance with Section 714 shall be permitted to penetrate a shaft enclosure.

713.8.1 Prohibited penetrations. Penetrations other than those necessary for the purpose of the shaft shall not be permitted in shaft enclosures.

713.9 Joints. Joints in a shaft enclosure shall comply with Section 715.

713.10 Duct and air transfer openings. Penetrations of a shaft enclosure by ducts and air transfer openings shall comply with Section 717.

713.11 Enclosure at the bottom. Shafts that do not extend to the bottom of the building or structure shall comply with one of the following:

1. They shall be enclosed at the lowest level with construction of the same *fire-resistance rating* as the lowest floor through which the shaft passes, but not less than the rating required for the shaft enclosure.
2. They shall terminate in a room having a use related to the purpose of the shaft. The room shall be separated from the remainder of the building by *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The *fire-resistance rating* and opening protectives shall be not less than the protection required for the shaft enclosure.
3. They shall be protected by *approved fire dampers* installed in accordance with their listing at the lowest floor level within the shaft enclosure.

Exceptions:

1. The fire-resistance-rated room separation is not required, provided there are no openings in or penetrations of the shaft enclosure to the interior of the building except at the bottom. The bottom of the shaft shall be closed off around the penetrating items with materials permitted by Section 718.3.1 for draftstopping, or the room shall be provided with an *approved automatic sprinkler system*.

2. A shaft enclosure containing a waste or linen chute shall not be used for any other purpose and shall discharge in a room protected in accordance with Section 713.13.4.
3. The fire-resistance-rated room separation and the protection at the bottom of the shaft are not required provided there are no combustibles in the shaft and there are no openings or other penetrations through the shaft enclosure to the interior of the building.

713.12 Enclosure at top. A shaft enclosure that does not extend to the underside of the roof sheathing, deck or slab of the building shall be enclosed at the top with construction of the same *fire-resistance rating* as the topmost floor penetrated by the shaft, but not less than the *fire-resistance rating* required for the shaft enclosure.

713.13 Waste and linen chutes and incinerator rooms. Waste and linen chutes shall comply with the provisions of NFPA 82, Chapter 5 and shall meet the requirements of Sections 713.13.1 through 713.13.6. Incinerator rooms shall meet the provisions of Sections 713.13.4 through 713.13.5.

Exception: Chutes serving and contained within a single dwelling unit.

713.13.1 Waste and linen. A shaft enclosure containing a recycling, or waste or linen chute shall not be used for any other purpose and shall be enclosed in accordance with Section 713.4. Openings into the shaft, from access rooms and discharge rooms, shall be protected in accordance with this section and Section 716. Openings into chutes shall not be located in *corridors*. Doors into chutes shall be self-closing. Discharge doors shall be self- or automatic-closing upon the actuation of a smoke detector in accordance with Section 716.5.9.3, except that heat-activated closing devices shall be permitted between the shaft and the discharge room.

713.13.2 Materials. A shaft enclosure containing a waste, recycling, or linen chute shall be constructed of materials as permitted by the building type of construction.

713.13.3 Chute access rooms. Access openings for waste or linen chutes shall be located in rooms or compartments enclosed by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. Openings into the access rooms shall be protected by opening protectives having a *fire protection rating* of not less than $\frac{3}{4}$ hour. Doors shall be self- or automatic-closing upon the detection of smoke in accordance with Section 716.5.9.3.

713.13.4 Chute discharge room. Waste or linen chutes shall discharge into an enclosed room separated by *fire barriers* with a *fire-resistance rating* not less than the required fire rating of the shaft enclosure and constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. Openings into the discharge room from the remainder of the building shall be protected by opening protectives having a *fire protection rating* equal to the protection required for the shaft enclosure. Doors shall be self- or automatic-

closing upon the detection of smoke in accordance with Section 716.5.9.3. Waste chutes shall not terminate in an incinerator room. Waste and linen rooms that are not provided with chutes need only comply with Table 509.

713.13.5 Incinerator room. Incinerator rooms shall comply with Table 509.

713.13.6 Automatic sprinkler system. An *approved automatic sprinkler system* shall be installed in accordance with Section 903.2.11.2.

713.14 Elevator, dumbwaiter and other hoistways. Elevator, dumbwaiter and other hoistway enclosures shall be constructed in accordance with Section 713 and Chapter 30.

SECTION 714 PENETRATIONS

714.1 Scope. The provisions of this section shall govern the materials and methods of construction used to protect *through penetrations* and *membrane penetrations* of *horizontal assemblies* and fire-resistance-rated wall assemblies.

714.1.1 Ducts and air transfer openings. Penetrations of fire-resistance-rated walls by ducts that are not protected with *dampers* shall comply with Sections 714.2 through 714.3.3. Penetrations of *horizontal assemblies* not protected with a shaft as permitted by Section 717.6, and not required to be protected with fire *dampers* by other sections of this code, shall comply with Sections 714.4 through 714.5.2. Ducts and air transfer openings that are protected with *dampers* shall comply with Section 717.

714.2 Installation details. Where sleeves are used, they shall be securely fastened to the assembly penetrated. The space between the item contained in the sleeve and the sleeve itself and any space between the sleeve and the assembly penetrated shall be protected in accordance with this section. Insulation and coverings on or in the penetrating item shall not penetrate the assembly unless the specific material used has been tested as part of the assembly in accordance with this section.

714.3 Fire-resistance-rated walls. Penetrations into or through *fire walls*, *fire barriers*, *smoke barrier walls* and *fire partitions* shall comply with Sections 714.3.1 through 714.3.3. Penetrations in smoke barrier walls shall also comply with Section 714.4.4.

714.3.1 Through penetrations. Through penetrations of fire-resistance-rated walls shall comply with Section 714.3.1.1 or 714.3.1.2.

Exception: Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, the *annular space* between the penetrating item and the fire-resistance-rated wall is permitted to be protected by either of the following measures:

1. In concrete or masonry walls where the penetrating item is a maximum 6-inch (152 mm) nominal diameter and the area of the opening through the wall does not exceed 144 square inches (0.0929

m²), concrete, grout or mortar is permitted where installed the full thickness of the wall or the thickness required to maintain the *fire-resistance rating*.

2. The material used to fill the *annular space* shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the *fire-resistance rating* of the construction penetrated.

714.3.1.1 Fire-resistance-rated assemblies. Penetrations shall be installed as tested in an *approved* fire-resistance-rated assembly.

714.3.1.2 Through-penetration firestop system. *Through penetrations* shall be protected by an *approved* penetration firestop system installed as tested in accordance with ASTM E814 or UL 1479, with a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water and shall have an F rating of not less than the required *fire-resistance rating* of the wall penetrated.

714.3.2 Membrane penetrations. Membrane penetrations shall comply with Section 714.3.1. Where walls or partitions are required to have a *fire-resistance rating*, recessed fixtures shall be installed such that the required fire resistance will not be reduced.

Exceptions:

1. Membrane penetrations of maximum 2-hour fire-resistance-rated walls and partitions by steel electrical boxes that do not exceed 16 square inches (0.0103 m²) in area, provided the aggregate area of the openings through the membrane does not exceed 100 square inches (0.0645 m²) in any 100 square feet (9.29 m²) of wall area. The *annular space* between the wall membrane and the box shall not exceed ¹/₈ inch (3.2 mm). Such boxes on opposite sides of the wall or partition shall be separated by one of the following:
 - 1.1. By a horizontal distance of not less than 24 inches (610 mm) where the wall or partition is constructed with individual noncommunicating stud cavities;
 - 1.2. By a horizontal distance of not less than the depth of the wall cavity where the wall cavity is filled with cellulose loose-fill, rockwool or slag mineral wool insulation;
 - 1.3. By solid fireblocking in accordance with Section 718.2.1;
 - 1.4. By protecting both outlet boxes with *listed* putty pads; or
 - 1.5. By other *listed* materials and methods.

2. Membrane penetrations by *listed* electrical boxes of any material, provided such boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The *annular space* between the wall membrane and the box shall not exceed $\frac{1}{8}$ inch (3.2 mm) unless *listed* otherwise. Such boxes on opposite sides of the wall or partition shall be separated by one of the following:

- 2.1. By the horizontal distance specified in the listing of the electrical boxes;
- 2.2. By solid fireblocking in accordance with Section 718.2.1;
- 2.3. By protecting both boxes with *listed* putty pads; or
- 2.4. By other *listed* materials and methods.

3. Membrane penetrations by electrical boxes of any size or type, that have been *listed* as part of a wall opening protective material system for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing.

4. Membrane penetrations by boxes other than electrical boxes, provided such penetrating items and the *annular space* between the wall membrane and the box, are protected by an *approved membrane penetration* firestop system installed as tested in accordance with ASTM E814 or UL 1479, with a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water, and shall have an F and T rating of not less than the required *fire-resistance rating* of the wall penetrated and be installed in accordance with their listing.

5. The *annular space* created by the penetration of an automatic sprinkler, provided it is covered by a metal escutcheon plate.

6. Membrane penetrations of maximum 2-hour *fire resistance-rated* walls and partitions by steel electrical boxes that exceed 16 square inches (0.0103 m²) in area, or steel electrical boxes of any size having an aggregate area through the membrane exceeding 100 square inches (0.0645 m²) in any 100 square feet (9.29 m²) of wall area, provided such penetrating items are protected by listed putty pads or other listed materials and methods, and installed in accordance with the listing.

714.3.3 Dissimilar materials. Noncombustible penetrating items shall not connect to combustible items beyond the point of firestopping unless it can be demonstrated that the fire-resistance integrity of the wall is maintained.

714.4 Horizontal assemblies. Penetrations of a *fire-resistance-rated* floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly not required to be enclosed in a shaft by Section 712.1 shall be protected in accordance with Sections 714.4.1 through 714.4.4.

714.4.1 Through penetrations. Through penetrations of *horizontal assemblies* shall comply with Section 714.4.1.1 or 714.4.1.2.

Exceptions:

1. Penetrations by steel, ferrous or copper conduits, pipes, tubes or vents or concrete or masonry items through a single fire-resistance-rated floor assembly where the *annular space* is protected with materials that prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the *fire-resistance rating* of the construction penetrated. Penetrating items with a maximum 6-inch (152 mm) nominal diameter shall not be limited to the penetration of a single fire-resistance-rated floor assembly, provided the aggregate area of the openings through the assembly does not exceed 144 square inches (92 900 mm²) in any 100 square feet (9.3 m²) of floor area.
2. Penetrations in a single concrete floor by steel, ferrous or copper conduits, pipes, tubes or vents with a maximum 6-inch (152 mm) nominal diameter, provided the concrete, grout or mortar is installed the full thickness of the floor or the thickness required to maintain the *fire-resistance rating*. The penetrating items shall not be limited to the penetration of a single concrete floor, provided the area of the opening through each floor does not exceed 144 square inches (92 900 mm²).
3. Penetrations by *listed* electrical boxes of any material, provided such boxes have been tested for use in fire-resistance-rated assemblies and installed in accordance with the instructions included in the listing.

714.4.1.1 Installation. *Through penetrations* shall be installed as tested in the *approved* fire-resistance-rated assembly.

714.4.1.2 Through-penetration firestop system. *Through penetrations* shall be protected by an *approved through-penetration firestop system* installed and tested in accordance with ASTM E814 or UL 1479, with a minimum positive pressure differential of 0.01 inch of water (2.49 Pa). The system shall have an F rating/T rating of not less than 1 hour but not less than the required rating of the floor penetrated.

Exceptions:

1. Floor penetrations contained and located within the cavity of a wall above the floor or below the floor do not require a T rating.
2. Floor penetrations by floor drains, tub drains or shower drains contained and

located within the concealed space of a horizontal assembly do not require a T rating.

3. Floor penetrations of maximum 4-inch (102 mm) nominal diameter penetrating directly into metal-enclosed electrical power switchgear do not require a T rating.

714.4.2 Membrane penetrations. Penetrations of membranes that are part of a *horizontal assembly* shall comply with Section 714.4.1.1 or 714.4.1.2. Where floor/ceiling assemblies are required to have a *fire-resistance rating*, recessed fixtures shall be installed such that the required *fire resistance* will not be reduced.

Exceptions:

1. *Membrane penetrations* by steel, ferrous or copper conduits, pipes, tubes or vents, or concrete or masonry items where the *annular space* is protected either in accordance with Section 714.4.1 or to prevent the free passage of flame and the products of combustion. The aggregate area of the openings through the membrane shall not exceed 100 square inches (64 500 mm²) in any 100 square feet (9.3 m²) of ceiling area in assemblies tested without penetrations.
2. *Ceiling membrane penetrations* of maximum 2-hour *horizontal assemblies* by steel electrical boxes that do not exceed 16 square inches (10 323 mm²) in area, provided the aggregate area of such penetrations does not exceed 100 square inches (44 500 mm²) in any 100 square feet (9.29 m²) of ceiling area, and the *annular space* between the ceiling membrane and the box does not exceed $\frac{1}{8}$ inch (3.2 mm).
3. *Membrane penetrations* by electrical boxes of any size or type, that have been *listed* as part of an opening protective material system for use in *horizontal assemblies* and are installed in accordance with the instructions included in the listing.
4. *Membrane penetrations* by *listed* electrical boxes of any material, provided such boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The *annular space* between the ceiling membrane and the box shall not exceed $\frac{1}{8}$ inch (3.2 mm) unless *listed* otherwise.
5. The *annular space* created by the penetration of a fire sprinkler, provided it is covered by a metal escutcheon plate.
6. Noncombustible items that are cast into concrete building elements and that do not penetrate both top and bottom surfaces of the element.
7. The ceiling membrane of 1- and 2-hour *fire-resistance-rated horizontal assemblies* is permitted to be interrupted with the double wood top plate of a wall assembly that is sheathed with Type X gypsum wallboard, provided that all penetrating

items through the double top plates are protected in accordance with Section 714.4.1.1 or 714.4.1.2 and the ceiling membrane is tight to the top plates.

714.4.3 Dissimilar materials. Noncombustible penetrating items shall not connect to combustible materials beyond the point of firestopping unless it can be demonstrated that the fire-resistance integrity of the *horizontal assembly* is maintained.

714.4.4 Penetrations in smoke barriers. Penetrations in *smoke barriers* shall be protected by an approved *through-penetration firestop system* installed and tested in accordance with the requirements of UL 1479 for air leakage. The *L rating* of the system measured at 0.30 inch (7.47 Pa) of water in both the ambient temperature and elevated temperature tests shall not exceed:

1. 5.0 cfm per square foot (0.025 m³/s • m²) of penetration opening for each *through-penetration firestop system*; or
2. A total cumulative leakage of 50 cfm (0.024 m³/s) for any 100 square feet (9.3 m²) of wall area, or floor area.

714.5 Nonfire-resistance-rated assemblies. Penetrations of nonfire-resistance-rated floor or floor/ceiling assemblies or the ceiling membrane of a nonfire-resistance-rated roof/ceiling assembly shall meet the requirements of Section 713 or shall comply with Section 714.5.1 or 714.5.2.

714.5.1 Noncombustible penetrating items. Noncombustible penetrating items that connect not more than five *stories* are permitted, provided that the *annular space* is filled to resist the free passage of flame and the products of combustion with an *approved* noncombustible material or with a fill, void or cavity material that is tested and classified for use in *through-penetration firestop systems*.

714.5.2 Penetrating items. Penetrating items that connect not more than two *stories* are permitted, provided that the *annular space* is filled with an *approved* material to resist the free passage of flame and the products of combustion.

SECTION 715 FIRE-RESISTANT JOINT SYSTEMS

715.1 General. Joints installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved *fire-resistant joint system* designed to resist the passage of fire for a time period not less than the required *fire-resistance rating* of the wall, floor or roof in or between which the system is installed. *Fire-resistant joint systems* shall be tested in accordance with Section 715.3.

Exception: *Fire-resistant joint systems* shall not be required for joints in all of the following locations:

1. Floors within a single *dwelling unit*.
2. Floors where the joint is protected by a shaft enclosure in accordance with Section 713.

3. Floors within atriums where the space adjacent to the atrium is included in the volume of the atrium for smoke control purposes.
4. Floors within malls.
5. Floors and ramps within open and enclosed parking garages or structures constructed in accordance with Sections 406.5 and 406.6, respectively.
6. Mezzanine floors.
7. Walls that are permitted to have unprotected openings.
8. Roofs where openings are permitted.
9. Control joints not exceeding a maximum width of 0.625 inch (15.9 mm) and tested in accordance with ASTM E119 or UL 263.

715.1.1 Curtain wall assembly. The void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly shall be protected in accordance with Section 715.4.

715.2 Installation. A *fire-resistant joint system* shall be securely installed in accordance with the listing criteria in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to accommodate expected building movements and to resist the passage of fire and hot gases.

715.3 Fire test criteria. *Fire-resistant joint systems* shall be tested in accordance with the requirements of either ASTM E1966 or UL 2079. Nonsymmetrical wall joint systems shall be tested with both faces exposed to the furnace, and the assigned *fire-resistance rating* shall be the shortest duration obtained from the two tests. Where evidence is furnished to show that the wall was tested with the least fire-resistant side exposed to the furnace, subject to acceptance of the *building official*, the wall need not be subjected to tests from the opposite side.

Exception: For *exterior walls* with a horizontal *fire separation distance* greater than 5 feet (1524 mm), the joint system shall be required to be tested for interior fire exposure only.

715.4 Exterior curtain wall/floor intersection. Where fire resistance-rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies shall be sealed with an *approved* system to prevent the interior spread of fire. Such systems shall be securely installed and tested in accordance with ASTM E2307 to provide an *F rating* for a time period not less than the *fire-resistance rating* of the floor assembly. Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 705.8.5.

Exception: Voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies where the vision glass extends to the finished floor level shall be permitted to be sealed with an approved material to prevent the interior spread of fire. Such material shall be securely installed and capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 time-temperature fire conditions

under a minimum positive pressure differential of 0.01 inch (0.254 mm) of water column (2.5 Pa) for the time period not less than the *fire-resistance rating* of the floor assembly.

715.4.1 Exterior curtain wall/nonfire-resistance-rated floor assembly intersections. Voids created at the intersection of exterior curtain wall assemblies and nonfire-resistance-rated floor or floor/ceiling assemblies shall be sealed with an *approved* material or system to retard the interior spread of fire and hot gases between *stories*.

715.4.2 Exterior curtain wall/vertical fire barrier intersections. Voids created at the intersection of nonfire-resistance-rated exterior curtain wall assemblies and *fire barriers* shall be filled. An approved material or system shall be used to fill the void and shall be securely installed in or on the intersection for its entire length so as not to dislodge, loosen or otherwise impair its ability to accommodate expected building movements and to retard the passage of fire and hot gases.

715.5 Spandrel wall. Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 705.8.5. Where Section 705.8.5 does not require a fire-resistance-rated spandrel wall, the requirements of Section 715.4 shall still apply to the intersection between the spandrel wall and the floor.

715.6 Fire-resistant joint systems in smoke barriers. *Fire-resistant joint systems* in *smoke barriers*, and joints at the intersection of a horizontal *smoke barrier* and an exterior curtain wall, shall be tested in accordance with the requirements of UL 2079 for air leakage. The *L rating* of the joint system shall not exceed 5 cfm per linear foot (0.00775 m³/s m) of joint at 0.30 inch (7.47 Pa) of water for both the ambient temperature and elevated temperature tests.

SECTION 716 OPENING PROTECTIVES

716.1 General. Opening protectives required by other sections of this code shall comply with the provisions of this section.

716.2 Fire-resistance-rated glazing. *Fire-resistance-rated glazing* tested as part of a *fire-resistance-rated* wall or floor/ceiling assembly in accordance with ASTM E119 or UL 263 and labeled in accordance with Section 703.6 shall not otherwise be required to comply with this section where used as part of a wall or floor/ceiling assembly. *Fire-resistance-rated glazing* shall be permitted in fire door and *fire window assemblies* where tested and installed in accordance with their listings and where in compliance with the requirements of this section.

716.3 Marking fire-rated glazing assemblies. *Fire-rated glazing* assemblies shall be marked in accordance with Tables 716.3, 716.5 and 716.6.

716.3.1 Fire-rated glazing identification. For *fire-rated glazing*, the *label* shall bear the identification required in Tables 716.3 and 716.5. "D" indicates that the glazing is permitted to be used in *fire door* assemblies and that the glazing meets the fire protection requirements of NFPA

252. “H” shall indicate that the glazing meets the hose stream requirements of NFPA 252. “T” shall indicate that the glazing meets the temperature requirements of Section 716.5.5.1. The placeholder “XXX” represents the fire-rating period, in minutes.

716.3.2 Fire-protection-rated glazing identification. For *fire-protection-rated* glazing, the *label* shall bear the following identification required in Tables 716.3 and 716.6: “OH – XXX.” “OH” indicates that the glazing meets both the fire protection and the hose-stream requirements of NFPA 257 or UL 9 and is permitted to be used in fire window openings. The placeholder “XXX” represents the fire-rating period, in minutes.

716.3.3 Fire-rated glazing that exceeds the code requirements. *Fire-rated glazing* assemblies marked as complying with hose stream requirements (H) shall be permitted in applications that do not require compliance with hose stream requirements. *Fire-rated glazing* assemblies marked as complying with temperature rise requirements (T) shall be permitted in applications that do not require compliance with temperature rise requirements. *Fire-rated glazing* assemblies marked with ratings (XXX) that exceed the ratings required by this code shall be permitted.

716.4 Alternative methods for determining fire protection ratings. The application of any of the alternative methods *listed* in this section shall be based on the fire exposure and acceptance criteria specified in NFPA 252, NFPA 257 or UL 9. The required *fire resistance* of an opening protective shall be permitted to be established by any of the following methods or procedures:

1. Designs documented in *approved* sources.
2. Calculations performed in an *approved* manner.
3. Engineering analysis based on a comparison of opening protective designs having *fire protection ratings* as determined by the test procedures set forth in NFPA 252, NFPA 257 or UL 9.
4. Alternative protection methods as allowed by Section 104.11.

716.5 Fire door and shutter assemblies. Approved *fire door* and fire shutter assemblies shall be constructed of any material or assembly of component materials that conforms to the test requirements of Section 716.5.1, 716.5.2 or 716.5.3 and the *fire protection rating* indicated in Table 716.5. *Fire door*

frames with transom lights, sidelights or both shall be permitted in accordance with Section 716.5.6. *Fire door* assemblies and shutters shall be installed in accordance with the provisions of this section and NFPA 80.

Exceptions:

1. Labeled protective assemblies that conform to the requirements of this section or UL 10A, UL 14B and UL 14C for tin-clad *fire door* assemblies.
2. Floor *fire door* assemblies in accordance with Section 712.1.13.1.

716.5.1 Side-hinged or pivoted swinging doors. *Fire door* assemblies with side-hinged and pivoted swinging doors shall be tested in accordance with NFPA 252 or UL 10C. After 5 minutes into the NFPA 252 test, the neutral pressure level in the furnace shall be established at 40 inches (1016 mm) or less above the sill.

716.5.2 Other types of assemblies. *Fire door* assemblies with other types of doors, including swinging elevator doors, horizontal sliding fire door assemblies, and fire shutter assemblies, bottom and side-hinged chute intake doors, and top-hinged chute discharge doors, shall be tested in accordance with NFPA 252 or UL 10B. The pressure in the furnace shall be maintained as nearly equal to the atmospheric pressure as possible. Once established, the pressure shall be maintained during the entire test period.

716.5.3 Door assemblies in corridors and smoke barriers. *Fire door* assemblies required to have a minimum *fire protection rating* of 20 minutes where located in *corridor* walls or *smoke barrier* walls having a *fire-resistance rating* in accordance with Table 716.5 shall be tested in accordance with NFPA 252 or UL 10C without the hose stream test.

Exceptions:

1. Viewports that require a hole not larger than 1 inch (25 mm) in diameter through the door, have not less than a 0.25-inch-thick (6.4 mm) glass disc and the holder is of metal that will not melt out where subject to temperatures of 1,700°F (927°C).
2. *Corridor* door assemblies in occupancies of Group I-2 shall be in accordance with Section 407.3.1.

**TABLE 716.3
MARKING FIRE-RATED GLAZING ASSEMBLIES**

| FIRE TEST STANDARD | MARKING | DEFINITION OF MARKING |
|------------------------------|---------|---|
| ASTM E119 or UL 263 | W | Meets wall assembly criteria. |
| NFPA 257 or UL 9 | OH | Meets fire window assembly criteria including the hose stream test. |
| NFPA 252 or UL 10B or UL 10C | D | Meets fire door assembly criteria. |
| | H | Meets fire door assembly hose stream test. |
| | T | Meets 450°F temperature rise criteria for 30 minutes |
| | XXX | The time in minutes of the fire resistance or fire protection rating of the glazing assembly. |

For SI: °C = [(°F) - 32]/1.8.

**TABLE 716.5
OPENING FIRE PROTECTION ASSEMBLIES, RATINGS AND MARKINGS**

| TYPE OF ASSEMBLY | REQUIRED WALL ASSEMBLY RATING (hours) | MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours) | DOOR VISION PANEL SIZE ^b | FIRE-RATED GLAZING MARKING DOOR VISION PANEL ^d | MINIMUM SIDELIGHT/TRANSOM ASSEMBLY RATING (hours) | | FIRE-RATED GLAZING MARKING SIDELIGHT/TRANSOM PANEL | |
|--|---------------------------------------|--|-------------------------------------|---|---|-----------------|--|-----------------|
| | | | | | Fire protection | Fire resistance | Fire protection | Fire resistance |
| Fire walls and fire barriers having a required fire-resistance rating greater than 1 hour | 4 | 3 | See Note b | D-H-W-240 | Not Permitted | 4 | Not Permitted | W-240 |
| | 3 | 3 ^a | See Note b | D-H-W-180 | Not Permitted | 3 | Not Permitted | W-180 |
| | 2 | 1½ | 100 sq. in. | ≤100 sq. in. = D-H-90 >100 sq. in. = D-H-W-90 | Not Permitted | 2 | Not Permitted | W-120 |
| | 1½ | 1½ | 100 sq. in. | ≤100 sq. in. = D-H-90 >100 sq. in. = D-H-W-90 | Not Permitted | 1½ | Not Permitted | W-90 |
| Enclosures for shafts, interior exit stairways and interior exit ramps. | 2 | 1½ | 100 sq. in. | ≤100 sq. in. = D-H-90 > 100 sq. in. = D-H-T-W-90 | Not Permitted | 2 | Not Permitted | W-120 |
| Horizontal exits in fire walls ^e | 4 | 3 | 100 sq. in. | ≤100 sq. in. = D-H-180 > 100 sq. in. = D-H-W-240 | Not Permitted | 4 | Not Permitted | W-240 |
| | 3 | 3 ^a | 100 sq. in. | ≤100 sq. in. = D-H-180 > 100 sq. in. = D-H-W-180 | Not Permitted | 3 | Not Permitted | W-180 |
| Fire barriers having a required fire-resistance rating of 1 hour: Enclosures for shafts, exit access stairways, exit access ramps, interior exit stairways and interior exit ramps; and exit passageway walls | 1 | 1 | 100 sq. in. ^c | ≤100 sq. in. = D-H-60 >100 sq. in. = D-H-T-W-60 | Not Permitted | 1 | Not Permitted | W-60 |
| | | | | | Fire protection | | | |
| Other fire barriers | 1 | ¾ | Maximum size tested | D-H | ¾ | | D-H | |
| Fire partitions: Corridor walls | 1 | ⅓ ^b | Maximum size tested | D-20 | ¾ ^b | | D-H-OH-45 | |
| | 0.5 | ⅓ ^b | Maximum size tested | D-20 | ⅓ | | D-H-OH-20 | |
| Other fire partitions | 1 | ¾ | Maximum size tested | D-H-45 | ¾ | | D-H-45 | |
| | 0.5 | ⅓ | Maximum size tested | D-H-20 | ⅓ | | D-H-20 | |

(continued)

TABLE 716.5—continued
OPENING FIRE PROTECTION ASSEMBLIES, RATINGS AND MARKINGS

| TYPE OF ASSEMBLY | REQUIRED WALL ASSEMBLY RATING (hours) | MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours) | DOOR VISION PANEL SIZE ^b | FIRE-RATED GLAZING MARKING DOOR VISION PANEL ^d | MINIMUM SIDELIGHT/TRANSOM ASSEMBLY RATING (hours) | | FIRE-RATED GLAZING MARKING SIDELIGHT/TRANSOM PANEL | |
|------------------|---------------------------------------|--|-------------------------------------|---|---|-----------------|--|-----------------|
| | | | | | Fire protection | Fire resistance | Fire protection | Fire resistance |
| Exterior walls | 3 | 1½ | 100 sq. in. ^b | ≤100 sq. in. = D-H-90 >100 sq. in. = D-H-W-90 | Not Permitted | 3 | Not Permitted | W-180 |
| | 2 | 1½ | 100 sq. in. ^b | ≤100 sq. in. = D-H-90 >100 sq. in. = D-H-W-90 | Not Permitted | 2 | Not Permitted | W-120 |
| | | | | | Fire protection | | | |
| | 1 | ¾ | Maximum size tested | D-H-45 | ¾ | | D-H-45 | |
| Smoke barriers | | | | | Fire protection | | | |
| | 1 | ⅓ | Maximum size tested | D-20 | ¾ | | D-H-OH-45 | |

For SI: 1 square inch = 645.2 mm.

- Two doors, each with a fire protection rating of 1½ hours, installed on opposite sides of the same opening in a fire wall, shall be deemed equivalent in fire protection rating to one 3-hour fire door.
- Fire-resistance-rated glazing tested to ASTM E119 in accordance with Section 716.2 shall be permitted, in the maximum size tested.
- Except where the building is equipped throughout with an automatic sprinkler and the fire-rated glazing meets the criteria established in Section 716.5.5.
- Under the column heading "Fire-rated glazing marking door vision panel," W refers to the *fire-resistance rating* of the glazing, not the frame.
- See Section 716.5.8.1.2.1.

- Unprotected openings shall be permitted for *corridors* in multitheater complexes where each motion picture auditorium has not fewer than one-half of its required *exit* or *exit access doorways* opening directly to the exterior or into an *exit* passageway.
- Horizontal sliding doors in *smoke barriers* that comply with Sections 408.6 and 408.8.4 in occupancies in Group I-3.

716.5.3.1 Smoke and draft control. *Fire door* assemblies shall meet the requirements for a smoke and draft control door assembly tested in accordance with UL 1784. The air leakage rate of the door assembly shall not exceed 3.0 cubic feet per minute per square foot (0.01524 m³/s • m²) of door opening at 0.10 inch (24.9 Pa) of water for both the ambient temperature and elevated temperature tests. Louvers shall be prohibited. Installation of smoke doors shall be in accordance with NFPA 105.

716.5.3.2 Glazing in door assemblies. In a 20-minute *fire door assembly*, the glazing material in the door itself shall have a minimum fire-protection-rated glazing of 20 minutes and shall be exempt from the hose stream test. Glazing material in any other part of the door assembly, including transom lights and sidelights, shall be tested in accordance with NFPA 257 or UL 9, including the hose stream test, in accordance with Section 716.6.

716.5.4 Door assemblies in other fire partitions. *Fire door* assemblies required to have a minimum fire protection rating of 20 minutes where located in other *fire parti-*

tions having a fire-resistance rating of 0.5 hour in accordance with Table 716.5 shall be tested in accordance with NFPA 252, UL 10B or UL 10C with the hose stream test.

716.5.5 Doors in interior exit stairways and ramps and exit passageways. *Fire door* assemblies in interior exit stairways and ramps and exit passageways shall have a maximum transmitted temperature rise of not more than 450°F (250°C) above ambient at the end of 30 minutes of standard fire test exposure.

Exception: The maximum transmitted temperature rise is not required in buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2.

716.5.5.1 Glazing in doors. Fire-protection-rated glazing in excess of 100 square inches (0.065 m²) is not permitted. Fire-resistance-rated glazing in excess of 100 square inches (0.065 m²) shall be permitted in *fire doors*. Listed *fire-resistance-rated* glazing in a *fire door* shall have a maximum transmitted temperature rise in accordance with Section 716.5.5 when the *fire door* is tested in accordance with NFPA 252, UL 10B or UL 10C.

716.5.6 Fire door frames with transom lights and sidelights. Door frames with transom lights, sidelights or both, shall be permitted where a ¾-hour *fire protection rating* or less is required in accordance with Table 716.5. *Fire door* frames with transom lights, sidelights, or both, installed with fire-resistance-rated glazing tested as an assembly in accordance with ASTM E119 or UL 263 shall

be permitted where a fire protection rating exceeding $\frac{3}{4}$ hour is required in accordance with Table 716.5.

716.5.7 Labeled protective assemblies. *Fire door* assemblies shall be labeled by an *approved agency*. The *labels* shall comply with NFPA 80, and shall be permanently affixed to the door or frame.

716.5.7.1 Fire door labeling requirements. *Fire doors* shall be labeled showing the name of the manufacturer or other identification readily traceable back to the manufacturer, the name or trademark of the third-party inspection agency, the *fire protection rating* and, where required for *fire doors* in interior exit stairways and ramps and exit passageways by Section 716.5.5, the maximum transmitted temperature end point. Smoke and draft control doors complying with UL 1784 shall be labeled as such and shall comply with Section 716.5.7.3. Labels shall be approved and permanently affixed. The label shall be applied at the factory or location where fabrication and assembly are performed.

716.5.7.1.1 Light kits, louvers and components. Listed light kits and louvers and their required preparations shall be considered as part of the labeled door where such installations are done under the listing program of the third-party agency. *Fire doors* and door assemblies shall be permitted to consist of components, including glazing, vision light kits and hardware that are listed or classified and labeled for such use by different third-party agencies.

716.5.7.2 Oversized doors. Oversized *fire doors* shall bear an oversized *fire door label* by an *approved agency* or shall be provided with a certificate of inspection furnished by an *approved testing agency*. Where a certificate of inspection is furnished by an *approved testing agency*, the certificate shall state that the door conforms to the requirements of design, materials and construction, but has not been subjected to the fire test.

716.5.7.3 Smoke and draft control door labeling requirements. Smoke and draft control doors complying with UL 1784 shall be labeled in accordance with Section 716.5.7.1 and shall show the letter “S” on the fire-rating *label* of the door. This marking shall indicate that the door and frame assembly are in compliance where *listed* or labeled gasketing is installed.

716.5.7.4 Fire door frame labeling requirements. *Fire door* frames shall be labeled showing the names of the manufacturer and the third-party inspection agency.

716.5.7.5 Fire door operator labeling requirements. *Fire door* operators for horizontal sliding doors shall be labeled and listed for use with the assembly.

716.5.8 Glazing material. *Fire-rated glazing* and *fire-resistance-rated glazing* conforming to the opening protection requirements in Section 716.5 shall be permitted in *fire door* assemblies.

716.5.8.1 Size limitations. *Fire-resistance-rated glazing* shall comply with the size limitations in Section

716.5.8.1.1. Fire-protection-rated glazing shall comply with the size limitations of NFPA 80, and as provided in Section 716.5.8.1.2.

716.5.8.1.1 Fire-resistance-rated glazing in door assemblies in fire walls and fire barriers rated greater than 1 hour. Fire-resistance-rated glazing tested to ASTM E119 or UL 263 and NFPA 252, UL 10B or UL 10C shall be permitted in *fire door assemblies* located in *fire walls* and in *fire barriers* in accordance with Table 716.5 to the maximum size tested and in accordance with their listings.

716.5.8.1.2 Fire-protection-rated glazing in door assemblies in fire walls and fire barriers rated greater than 1 hour. Fire-protection-rated glazing shall be prohibited in *fire walls* and *fire barriers* except as provided in Sections 716.5.8.1.2.1 and 716.5.8.1.2.2.

716.5.8.1.2.1 Horizontal exits. Fire-protection-rated glazing shall be permitted as vision panels in *self-closing* swinging *fire door* assemblies serving as horizontal exits in *fire walls* where limited to 100 square inches (0.065 m²) with no dimension exceeding 10 inches (0.3 mm).

716.5.8.1.2.2 Fire barriers. Fire-protection-rated glazing shall be permitted in *fire doors* having a $1\frac{1}{2}$ -hour *fire protection rating* intended for installation in *fire barriers*, where limited to 100 square inches (0.065 m²).

716.5.8.2 Elevator, stairway and ramp protectives. Approved fire-protection-rated glazing used in *fire door* assemblies in elevator, stairway and ramp enclosures shall be so located as to furnish clear vision of the passageway or approach to the elevator, stairway or ramp.

716.5.8.3 Labeling. *Fire-rated glazing* shall bear a *label* or other identification showing the name of the manufacturer, the test standard and information required in Table 716.3 that shall be issued by an *approved agency* and shall be permanently identified on the glazing.

716.5.8.4 Safety glazing. *Fire-protection-rated glazing* and *fire-resistance-rated glazing* installed in *fire door* assemblies shall comply with the safety glazing requirements of Chapter 24 where applicable.

716.5.9 Door closing. *Fire doors* shall be latching and self- or automatic-closing in accordance with this section.

Exceptions:

1. *Fire doors* located in common walls separating *sleeping units* in Group R-1 shall be permitted without automatic- or *self-closing* devices.
2. The elevator car doors and the associated hoistway enclosure doors at the floor level designated for recall in accordance with Section 3003.2 shall be permitted to remain open during Phase I emergency recall operation.

716.5.9.1 Latch required. Unless otherwise specifically permitted, single *fire doors* and both leaves of pairs of side-hinged swinging *fire doors* shall be provided with an active latch bolt that will secure the door when it is closed.

716.5.9.1.1 Chute intake door latching. Chute intake doors shall be positive latching, remaining latched and closed in the event of latch spring failure during a fire emergency.

716.5.9.2 Automatic-closing fire door assemblies. Automatic-closing *fire door* assemblies shall be *self-closing* in accordance with NFPA 80.

716.5.9.3 Smoke-activated doors. Automatic-closing doors installed in the following locations shall be automatic-closing by the actuation of smoke detectors installed in accordance with Section 907.3 or by loss of power to the smoke detector or hold-open device. Doors that are automatic-closing by smoke detection shall not have more than a 10-second delay before the door starts to close after the smoke detector is actuated:

1. Doors installed across a *corridor*.
2. Doors installed in the enclosures of *exit access stairways* and *ramps* in accordance with Sections 1019 and 1023, respectively.
3. Doors that protect openings in *exits* or *corridors* required to be of fire-resistance-rated construction.
4. Doors that protect openings in walls that are capable of resisting the passage of smoke in accordance with Section 509.4.
5. Doors installed in *smoke barriers* in accordance with Section 709.5.
6. Doors installed in *fire partitions* in accordance with Section 708.6.
7. Doors installed in a *fire wall* in accordance with Section 706.8.
8. Doors installed in shaft enclosures in accordance with Section 713.7.
9. Doors installed in waste and linen chutes, discharge openings and access and discharge rooms in accordance with Section 713.13. Loading doors installed in waste and linen chutes shall meet the requirements of Sections 716.5.9 and 716.5.9.1.1.
10. Doors installed in the walls for compartmentation of underground buildings in accordance with Section 405.4.2.
11. Doors installed in the elevator lobby walls of underground buildings in accordance with Section 405.4.3.
12. Doors installed in smoke partitions in accordance with Section 710.5.2.3.

716.5.9.4 Doors in pedestrian ways. Vertical sliding or vertical rolling steel *fire doors* in openings through

which pedestrians travel shall be heat activated or activated by smoke detectors with alarm verification.

716.5.10 Swinging fire shutters. Where fire shutters of the swinging type are installed in exterior openings, not less than one row in every three vertical rows shall be arranged to be readily opened from the outside, and shall be identified by distinguishing marks or letters not less than 6 inches (152 mm) high.

716.5.11 Rolling fire shutters. Where fire shutters of the rolling type are installed, such shutters shall include *approved* automatic-closing devices.

716.6 Fire-protection-rated glazing. Glazing in *fire window assemblies* shall be fire protection rated in accordance with this section and Table 716.6. Glazing in *fire door* assemblies shall comply with Section 716.5.8. Fire-protection-rated glazing in fire window assemblies shall be tested in accordance with and shall meet the acceptance criteria of NFPA 257 or UL 9. Fire-protection-rated glazing shall comply with NFPA 80. Openings in nonfire-resistance-rated *exterior wall* assemblies that require protection in accordance with Section 705.3, 705.8, 705.8.5 or 705.8.6 shall have a fire protection rating of not less than $\frac{3}{4}$ hour. Fire-protection-rated glazing in 0.5-hour fire-resistance-rated partitions is permitted to have an 0.33-hour fire protection rating.

716.6.1 Testing under positive pressure. NFPA 257 or UL 9 shall evaluate fire-protection-rated glazing under positive pressure. Within the first 10 minutes of a test, the pressure in the furnace shall be adjusted so not less than two-thirds of the test specimen is above the neutral pressure plane, and the neutral pressure plane shall be maintained at that height for the balance of the test.

716.6.2 Nonsymmetrical glazing systems. Nonsymmetrical fire-protection-rated glazing systems in *fire partitions*, *fire barriers* or in *exterior walls* with a *fire separation distance* of 5 feet (1524 mm) or less pursuant to Section 705 shall be tested with both faces exposed to the furnace, and the assigned *fire protection rating* shall be the shortest duration obtained from the two tests conducted in compliance with NFPA 257 or UL 9.

716.6.3 Safety glazing. *Fire-protection-rated* glazing and *fire-resistance-rated* glazing installed in *fire window assemblies* shall comply with the safety glazing requirements of Chapter 24 where applicable.

716.6.4 Glass and glazing. Glazing in *fire window assemblies* shall be fire-protection-rated glazing installed in accordance with and complying with the size limitations set forth in NFPA 80.

716.6.5 Installation. Fire-protection-rated glazing shall be in the fixed position or be automatic-closing and shall be installed in *approved* frames.

716.6.6 Window mullions. Metal mullions that exceed a nominal height of 12 feet (3658 mm) shall be protected with materials to afford the same *fire-resistance rating* as required for the wall construction in which the protective is located.

TABLE 716.6
FIRE WINDOW ASSEMBLY FIRE PROTECTION RATINGS

| TYPE OF WALL ASSEMBLY | REQUIRED WALL ASSEMBLY RATING (hours) | MINIMUM FIRE WINDOW ASSEMBLY RATING (hours) | FIRE-RATED GLAZING MARKING |
|--|---------------------------------------|---|-----------------------------|
| Interior walls | | | |
| Fire walls | All | NP ^a | W-XXX ^b |
| Fire barriers | >1 | NP ^a | W-XXX ^b |
| | 1 | NP ^a | W-XXX ^b |
| Incidental use areas (Section 707.3.7), Mixed occupancy separations (Section 707.3.9) | 1 | $\frac{3}{4}$ | OH-45 or W-60 |
| Fire partitions | 1 | $\frac{3}{4}$ | OH-45 or W-60 |
| | 0.5 | $\frac{1}{3}$ | OH-20 or W-30 |
| Smoke barriers | 1 | $\frac{3}{4}$ | OH-45 or W-60 |
| Exterior walls | >1 | $1\frac{1}{2}$ | OH-90 or W-XXX ^b |
| | 1 | $\frac{3}{4}$ | OH-45 or W-60 |
| | 0.5 | $\frac{1}{3}$ | OH-20 or W-30 |
| Party wall | All | NP | Not Applicable |

NP = Not Permitted.

a. Not permitted except fire-resistance-rated glazing assemblies tested to ASTM E119 or UL 263, as specified in Section 716.2.

b. XXX = The fire rating duration period in minutes, which shall be equal to the *fire-resistance rating* required for the wall assembly.

716.6.7 Interior fire window assemblies. Fire-protection-rated glazing used in *fire window assemblies* located in *fire partitions* and *fire barriers* shall be limited to use in assemblies with a maximum *fire-resistance rating* of 1 hour in accordance with this section.

716.6.7.1 Where $\frac{3}{4}$ -hour fire protection window assemblies permitted. Fire-protection-rated glazing requiring 45-minute opening protection in accordance with Table 716.6 shall be limited to *fire partitions* designed in accordance with Section 708 and *fire barriers* utilized in the applications set forth in Sections 707.3.6, 707.3.7 and 707.3.9 where the *fire-resistance rating* does not exceed 1 hour. Fire-resistance-rated glazing assemblies tested in accordance with ASTM E119 or UL 263 shall not be subject to the limitations of this section.

716.6.7.2 Area limitations. The total area of the glazing in fire-protection-rated window assemblies shall not exceed 25 percent of the area of a common wall with any room.

716.6.7.3 Where $\frac{1}{3}$ -hour fire-protection window assemblies permitted. Fire-protection-rated glazing shall be permitted in window assemblies tested to NFPA 257 or UL 9 in *smoke barriers* and *fire partitions* requiring $\frac{1}{3}$ -hour opening protection in accordance with Table 716.6.

716.6.8 Labeling requirements. Fire-protection-rated glazing shall bear a label or other identification showing the name of the manufacturer, the test standard and information required in Section 716.3.2 and Table 716.6 that shall be issued by an approved agency and permanently identified on the glazing.

SECTION 717 DUCTS AND AIR TRANSFER OPENINGS

717.1 General. The provisions of this section shall govern the protection of duct penetrations and air transfer openings in assemblies required to be protected and duct penetrations in nonfire-resistance-rated floor assemblies.

717.1.1 Ducts and air transfer openings. Ducts transitioning horizontally between shafts shall not require a shaft enclosure provided that the duct penetration into each associated shaft is protected with *dampers* complying with this section.

717.1.2 Ducts that penetrate fire-resistance-rated assemblies without dampers. Ducts that penetrate fire-resistance-rated assemblies and are not required by this section to have *dampers* shall comply with the requirements of Sections 714.2 through 714.3.3. Ducts that penetrate *horizontal assemblies* not required to be contained within a shaft and not required by this section to have *dampers* shall comply with the requirements of Sections 714.4 through 714.5.2.

717.1.2.1 Ducts that penetrate nonfire-resistance-rated assemblies. The space around a duct penetrating a nonfire-resistance-rated floor assembly shall comply with Section 717.6.3.

717.2 Installation. *Fire dampers, smoke dampers, combination fire/smoke dampers* and *ceiling radiation dampers* located within air distribution and smoke control systems shall be installed in accordance with the requirements of this section, the manufacturer's instructions and the *dampers'* listing.

717.2.1 Smoke control system. Where the installation of a *fire damper* will interfere with the operation of a required smoke control system in accordance with Section

909, *approved* alternative protection shall be utilized. Where mechanical systems including ducts and *dampers* utilized for normal building ventilation serve as part of the smoke control system, the expected performance of these systems in smoke control mode shall be addressed in the rational analysis required by Section 909.4.

717.2.2 Hazardous exhaust ducts. *Fire dampers* for hazardous exhaust duct systems shall comply with the *Mechanical Code*.

717.3 Damper testing, ratings and actuation. *Damper* testing, ratings and actuation shall be in accordance with Sections 717.3.1 through 717.3.3.

717.3.1 Damper testing. Dampers shall be listed and labeled in accordance with the standards in this section.

1. *Fire dampers* shall comply with the requirements of UL 555. Only *fire dampers* and *ceiling radiation dampers* labeled for use in dynamic systems shall be installed in heating, ventilation and air-conditioning systems designed to operate with fans on during a fire.
2. Smoke dampers shall comply with the requirements of UL 555S.
3. Combination fire/smoke dampers shall comply with the requirements of both UL 555 and UL 555S.
4. Ceiling radiation dampers shall comply with the requirements of UL 555C or shall be tested as part of a fire-resistance-rated floor/ceiling or roof/ceiling assembly in accordance with ASTM E119 or UL 263.
5. *Corridor dampers* shall comply with requirements of both UL 555 and UL 555S. *Corridor dampers* shall demonstrate acceptable closure performance when subjected to 150 feet per minute (0.76 mps) velocity across the face of the damper during the UL 555 fire exposure test.

717.3.2 Damper rating. *Damper* ratings shall be in accordance with Sections 717.3.2.1 through 717.3.2.4.

717.3.2.1 Fire damper ratings. *Fire dampers* shall have the minimum *fire protection rating* specified in Table 717.3.2.1 for the type of penetration.

TABLE 717.3.2.1
FIRE DAMPER RATING

| TYPE OF PENETRATION | MINIMUM DAMPER RATING (hours) |
|--|-------------------------------|
| Less than 3-hour fire-resistance-rated assemblies | 1.5 |
| 3-hour or greater fire-resistance-rated assemblies | 3 |

717.3.2.2 Smoke damper ratings. *Smoke damper* leakage ratings shall be Class I or II. Elevated temperature ratings shall be not less than 250°F (121°C).

717.3.2.3 Combination fire/smoke damper ratings. *Combination fire/smoke dampers* shall have the mini-

mum *fire protection rating* specified for *fire dampers* in Table 717.3.2.1 for the type of penetration and shall have a minimum *smoke damper* rating as specified in Section 717.3.2.2.

717.3.2.4 Corridor damper ratings. *Corridor dampers* shall have the following minimum ratings:

1. One hour *fire-resistance rating*.
2. Class I or II leakage rating as specified in Section 717.3.2.2.

717.3.3 Damper actuation. *Damper* actuation shall be in accordance with Sections 717.3.3.1 through 717.3.3.5 as applicable.

717.3.3.1 Fire damper actuation device. The *fire damper* actuation device shall meet one of the following requirements:

1. The operating temperature shall be approximately 50°F (10°C) above the normal temperature within the duct system, but not less than 160°F (71°C).
2. The operating temperature shall be not more than 350°F (177°C) where located in a smoke control system complying with Section 909.

717.3.3.2 Smoke damper actuation. The *smoke damper* shall close upon actuation of a *listed* smoke detector or detectors installed in accordance with Section 907.3 and one of the following methods, as applicable:

1. Where a *smoke damper* is installed within a duct, a smoke detector shall be installed inside the duct or outside the duct with sampling tubes protruding into the duct. The detector or tubes within the duct shall be within 5 feet (1524 mm) of the *damper*. Air outlets and inlets shall not be located between the detector or tubes and the *damper*. The detector shall be *listed* for the air velocity, temperature and humidity anticipated at the point where it is installed. Other than in mechanical smoke control systems, *dampers* shall be closed upon fan shutdown where local smoke detectors require a minimum velocity to operate.
2. Where a *smoke damper* is installed above *smoke barrier* doors in a *smoke barrier*, a spot-type detector shall be installed on either side of the *smoke barrier* door opening. The detector shall be listed for releasing service if used for direct interface with the damper.
3. Where a *smoke damper* is installed within an air transfer opening in a wall, a spot-type detector shall be installed within 5 feet (1524 mm) horizontally of the *damper*. The detector shall be listed for releasing service if used for direct interface with the damper.

4. Where a *smoke damper* is installed in a *corridor* wall or ceiling, the *damper* shall be permitted to be controlled by a smoke detection system installed in the *corridor*.
5. Where a smoke detection system is installed in all areas served by the duct in which the damper will be located, the *smoke dampers* shall be permitted to be controlled by the smoke detection system.

717.3.3.3 Combination fire/smoke damper actuation. *Combination fire/smoke damper* actuation shall be in accordance with Sections 717.3.3.1 and 717.3.3.2. *Combination fire/smoke dampers* installed in smoke control system shaft penetrations shall not be activated by local area smoke detection unless it is secondary to the smoke management system controls.

717.3.3.4 Ceiling radiation damper actuation. The operating temperature of a *ceiling radiation damper* actuation device shall be 50°F (27.8°C) above the normal temperature within the duct system, but not less than 160°F (71°C).

717.3.3.5 Corridor damper actuation. *Corridor damper* actuation shall be in accordance with Sections 717.3.3.1 and 717.3.3.2.

717.4 Access and identification. Fire and smoke *dampers* shall be provided with an *approved* means of access that is large enough to *permit* inspection and maintenance of the *damper* and its operating parts. The access shall not affect the integrity of fire-resistance-rated assemblies. The access openings shall not reduce the *fire-resistance rating* of the assembly. Access points shall be permanently identified on the exterior by a *label* having letters not less than 1/2 inch (12.7 mm) in height reading: FIRE/SMOKE DAMPER, SMOKE DAMPER or FIRE DAMPER. Access doors in ducts shall be tight fitting and suitable for the required duct construction.

717.5 Where required. *Fire, dampers, smoke dampers, combination fire/smoke dampers, ceiling radiation dampers and corridor dampers* shall be provided at the locations prescribed in Sections 717.5.1 through 717.5.7 and 717.6. Where an assembly is required to have both *fire dampers* and *smoke dampers, combination fire/smoke dampers* or a *fire damper* and a *smoke damper* shall be provided.

717.5.1 Fire walls. Ducts and air transfer openings permitted in *fire walls* in accordance with Section 706.11 shall be protected with *listed fire dampers* installed in accordance with their listing.

717.5.1.1 Horizontal exits. A *listed smoke damper* designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a *fire wall* that serves as a horizontal *exit*.

717.5.2 Fire barriers. Ducts and air transfer openings of *fire barriers* shall be protected with *approved fire dampers* installed in accordance with their listing. Ducts and air transfer openings shall not penetrate enclosures for *interior exit stairways* and *ramps* and *exit passageways*,

except as permitted by Sections 1023.5 and 1024.6, respectively.

Exception: *Fire dampers* are not required at penetrations of *fire barriers* where any of the following apply:

1. Penetrations are tested in accordance with ASTM E119 or UL 263 as part of the fire-resistance-rated assembly.
2. Ducts are used as part of an *approved* smoke control system in accordance with Section 909 and where the use of a *fire damper* would interfere with the operation of a smoke control system.
3. Such walls are penetrated by ducted HVAC systems, have a required *fire-resistance rating* of 1 hour or less, are in areas of other than Group H and are in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2. For the purposes of this exception, a ducted HVAC system shall be a duct system for conveying supply, return or exhaust air as part of the structure's HVAC system. Such a duct system shall be constructed of sheet steel not less than No. 26 gage thickness and shall be continuous from the air-handling appliance or equipment to the air outlet and inlet terminals.

717.5.2.1 Horizontal exits. A *listed smoke damper* designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a *fire barrier* that serves as a horizontal *exit*.

717.5.3 Shaft enclosures. Shaft enclosures that are permitted to be penetrated by ducts and air transfer openings shall be protected with *approved* fire and smoke *dampers* installed in accordance with their listing.

Exceptions:

1. Fire and *smoke dampers* are not required at penetrations of exhaust shafts where steel exhaust subducts extend not less than 22 inches (559 mm) vertically in exhaust shafts provided there is a continuous airflow upward to the outside and the fan is provided with backup standby power.
2. *Fire dampers* are not required where penetrations are tested in accordance with ASTM E119 or UL 263 as part of the fire-resistance-rated assembly.
3. Fire and *smoke dampers* are not required where ducts are used as part of an *approved* smoke control system in accordance with Section 909.
4. Fire and *smoke dampers* are not required where the penetrations are in dedicated parking garage exhaust or supply shafts that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.
5. *Smoke dampers* are not required at penetrations of shafts where the building is equipped through-

out with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.

6. *Fire dampers* and *combination fire/smoke dampers* are not required in kitchen and clothes dryer exhaust systems when installed in accordance with the *Mechanical Code*.

717.5.4 Fire partitions. Ducts and air transfer openings that penetrate *fire partitions* shall be protected with *listed fire dampers* installed in accordance with their listing.

Exceptions: In occupancies other than Group H, *fire dampers* are not required where any of the following apply:

1. Corridor walls in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2 and the duct is protected as a *through penetration* in accordance with Section 714.
2. Tenant partitions in *covered and open mall buildings* where the walls are not required by provisions elsewhere in the code to extend to the underside of the floor or roof sheathing, slab or deck above.
3. The duct system is constructed of *approved materials* in accordance with the *Mechanical Code* and the duct penetrating the wall complies with all of the following requirements:
 - 3.1. The duct shall not exceed 100 square inches (0.06 m²).
 - 3.2. The duct shall be constructed of steel not less than 0.0217 inch (0.55 mm) in thickness.
 - 3.3. The duct shall not have openings that communicate the *corridor* with adjacent spaces or rooms.
 - 3.4. The duct shall be installed above a ceiling.
 - 3.5. The duct shall not terminate at a wall register in the fire-resistance-rated wall.
 - 3.6. A minimum 12-inch-long (305 mm) by 0.060-inch-thick (1.52 mm) steel sleeve shall be centered in each duct opening. The sleeve shall be secured to both sides of the wall and all four sides of the sleeve with minimum 1½-inch by 1½-inch by 0.060-inch (38 mm by 38 mm by 1.52 mm) steel retaining angles. The retaining angles shall be secured to the sleeve and the wall with No. 10 (M5) screws. The *annular space* between the steel sleeve and the wall opening shall be filled with *mineral wool* batting on all sides.
4. Such walls are penetrated by ducted HVAC systems, have a required *fire-resistance rating* of 1 hour or less, and are in buildings equipped throughout with an automatic sprinkler system in

accordance with Section 903.3.1.1 or 903.3.1.2. For the purposes of this exception, a ducted HVAC system shall be a duct system for conveying supply, return or exhaust air as part of the structure's HVAC system. Such a duct system shall be constructed of sheet steel not less than No. 26 gage thickness and shall be continuous from the air-handling appliance or equipment to the air outlet and inlet terminals.

717.5.4.1 Corridors. Duct and air transfer openings that penetrate *corridors* shall be protected with dampers as follows:

1. A *corridor damper* shall be provided where corridor ceilings, constructed as required for the corridor walls as permitted in Section 708.4, Exception 3, are penetrated.
2. A *ceiling radiation damper* shall be provided where the ceiling membrane of a *fire-resistance-rated* floor-ceiling or roof-ceiling assembly, constructed as permitted in Section 708.4, Exception 2, is penetrated.
3. A listed smoke damper designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a corridor enclosure required to have smoke and draft control doors in accordance with Section 716.5.3.

Exceptions:

1. *Smoke dampers* are not required where the building is equipped throughout with an *approved smoke control system* in accordance with Section 909, and *smoke dampers* are not necessary for the operation and control of the system.
2. *Smoke dampers* are not required in *corridor penetrations* where the duct is constructed of steel not less than 0.019 inch (0.48 mm) in thickness and there are no openings serving the *corridor*.

717.5.5 Smoke barriers. A *listed smoke damper* designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a *smoke barrier*. *Smoke dampers* and *smoke damper* actuation methods shall comply with Section 717.3.3.2.

Exceptions:

1. *Smoke dampers* are not required where the openings in ducts are limited to a single *smoke compartment* and the ducts are constructed of steel.
2. *Smoke dampers* are not required in *smoke barriers* required by Section 407.5 for Group I-2, Condition 2—where the HVAC system is fully ducted in accordance with Section 603 of the *Mechanical Code* and where buildings are equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 and equipped with quick-response sprinklers in accordance with Section 903.3.2.

717.5.6 Exterior walls. Ducts and air transfer openings in fire-resistance-rated *exterior walls* required to have protected openings in accordance with Section 705.10 shall be protected with *listed fire dampers* installed in accordance with their listing.

717.5.7 Smoke partitions. A *listed smoke damper* designed to resist the passage of smoke shall be provided at each point that an air transfer opening penetrates a smoke partition. *Smoke dampers* and *smoke damper* actuation methods shall comply with Section 717.3.3.2.

Exception: Where the installation of a *smoke damper* will interfere with the operation of a required smoke control system in accordance with Section 909, *approved* alternative protection shall be utilized.

717.6 Horizontal assemblies. Penetrations by ducts and air transfer openings of a floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly shall be protected by a shaft enclosure that complies with Section 713 or shall comply with Sections 717.6.1 through 717.6.3.

717.6.1 Through penetrations. In occupancies other than Groups I-2 and I-3, a duct constructed of *approved* materials in accordance with the *Mechanical Code* that penetrates a fire-resistance-rated floor/ceiling assembly that connects not more than two *stories* is permitted without shaft enclosure protection, provided a *listed fire damper* is installed at the floor line or the duct is protected in accordance with Section 714.4. For air transfer openings, see Section 712.1.9.

Exception: A duct is permitted to penetrate three floors or less without a *fire damper* at each floor, provided such duct meets all of the following requirements:

1. The duct shall be contained and located within the cavity of a wall and shall be constructed of steel having a minimum wall thickness of 0.0187 inches (0.4712 mm) (No. 26 gage).
2. The duct shall open into only one *dwelling or sleeping unit* and the duct system shall be continuous from the unit to the exterior of the building.
3. The duct shall not exceed 4-inch (102 mm) nominal diameter and the total area of such ducts shall not exceed 100 square inches (0.065 m²) in any 100 square feet (9.3 m²) of floor area.
4. The *annular space* around the duct is protected with materials that prevent the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 or UL 263 time-temperature conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the *fire-resistance rating* of the construction penetrated.
5. Grille openings located in a ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly shall be protected with a *listed ceiling radiation damper* installed in accordance with Section 717.6.2.1.

717.6.2 Membrane penetrations. Ducts and air transfer openings constructed of *approved* materials in accordance with the *Mechanical Code* that penetrate the ceiling membrane of a fire-resistance-rated floor/ceiling or roof/ceiling assembly shall be protected with one of the following:

1. A shaft enclosure in accordance with Section 713.
2. A *listed ceiling radiation damper* installed at the ceiling line where a duct penetrates the ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly.
3. A *listed ceiling radiation damper* installed at the ceiling line where a diffuser with no duct attached penetrates the ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly.

717.6.2.1 Ceiling radiation dampers. *Ceiling radiation dampers* shall be tested in accordance with Section 717.3.1. *Ceiling radiation dampers* shall be installed in accordance with the details *listed* in the fire-resistance-rated assembly and the manufacturer's instructions and the listing. *Ceiling radiation dampers* are not required where one of the following applies:

1. Tests in accordance with ASTM E119 or UL 263 have shown that *ceiling radiation dampers* are not necessary in order to maintain the *fire-resistance rating* of the assembly.
2. Where exhaust duct penetrations are protected in accordance with Section 714.4.2, are located within the cavity of a wall and do not pass through another *dwelling unit* or tenant space.
3. Where duct and air transfer openings are protected with a duct outlet protection system tested as part of a *fire-resistance-rated* assembly in accordance with ASTM E119 or UL 263.

717.6.3 Nonfire-resistance-rated floor assemblies. Duct systems constructed of *approved* materials in accordance with the *Mechanical Code* that penetrate nonfire-resistance-rated floor assemblies shall be protected by any of the following methods:

1. A shaft enclosure in accordance with Section 713.
2. The duct connects not more than two *stories*, and the *annular space* around the penetrating duct is protected with an *approved* noncombustible material that resists the free passage of flame and the products of combustion.
3. In floor assemblies composed of noncombustible materials, a shaft shall not be required where the duct connects not more than three stories, the annular space around the penetrating duct is protected with an *approved* noncombustible material that resists the free passage of flame and the products of combustion and a *fire damper* is installed at each floor line.

Exception: *Fire dampers* are not required in ducts within individual residential *dwelling units*.

717.7 Flexible ducts and air connectors. Flexible ducts and air connectors shall not pass through any fire-resistance-rated assembly. Flexible air connectors shall not pass through any wall, floor or ceiling.

SECTION 718 CONCEALED SPACES

718.1 General. *Fireblocking* and draftstopping shall be installed in combustible concealed locations in accordance with this section. *Fireblocking* shall comply with Section 718.2. Draftstopping in floor/ceiling spaces and *attic* spaces shall comply with Sections 718.3 and 718.4, respectively. The permitted use of combustible materials in concealed spaces of buildings of Type I or II construction shall be limited to the applications indicated in Section 718.5.

718.2 Fireblocking. In combustible construction, *fireblocking* shall be installed to cut off concealed draft openings (both vertical and horizontal) and shall form an effective barrier between floors, between a top *story* and a roof or *attic* space. *Fireblocking* shall be installed in the locations specified in Sections 718.2.2 through 718.2.7.

718.2.1 Fireblocking materials. *Fireblocking* shall consist of the following materials:

1. Two-inch (51 mm) nominal lumber.
2. Two thicknesses of 1-inch (25 mm) nominal lumber with broken lap joints.
3. One thickness of 0.719-inch (18.3 mm) wood structural panels with joints backed by 0.719-inch (18.3 mm) wood structural panels.
4. One thickness of 0.75-inch (19.1 mm) particleboard with joints backed by 0.75-inch (19 mm) particleboard.
5. One-half-inch (12.7 mm) gypsum board.
6. One-fourth-inch (6.4 mm) cement-based millboard.
7. Batts or blankets of *mineral wool*, *mineral fiber* or other *approved* materials installed in such a manner as to be securely retained in place.
8. Cellulose insulation installed as tested for the specific application.

718.2.1.1 Batts or blankets of mineral wool or mineral fiber. Batts or blankets of *mineral wool* or *mineral fiber* or other *approved* nonrigid materials shall be permitted for compliance with the 10-foot (3048 mm) horizontal *fireblocking* in walls constructed using parallel rows of studs or staggered studs.

718.2.1.2 Unfaced fiberglass. Unfaced fiberglass batt insulation used as *fireblocking* shall fill the entire cross section of the wall cavity to a minimum height of 16 inches (406 mm) measured vertically. Where piping, conduit or similar obstructions are encountered, the insulation shall be packed tightly around the obstruction.

718.2.1.3 Loose-fill insulation material. Loose-fill insulation material, insulating foam sealants and caulk

materials shall not be used as a fireblock unless specifically tested in the form and manner intended for use to demonstrate its ability to remain in place and to retard the spread of fire and hot gases.

718.2.1.4 Fireblocking integrity. The integrity of fireblocks shall be maintained.

718.2.1.5 Double stud walls. Batts or blankets of mineral or glass fiber or other *approved* nonrigid materials shall be allowed as *fireblocking* in walls constructed using parallel rows of studs or staggered studs.

718.2.2 Concealed wall spaces. *Fireblocking* shall be provided in concealed spaces of stud walls and partitions, including furred spaces, and parallel rows of studs or staggered studs, as follows:

1. Vertically at the ceiling and floor levels.
2. Horizontally at intervals not exceeding 10 feet (3048 mm).

718.2.3 Connections between horizontal and vertical spaces. *Fireblocking* shall be provided at interconnections between concealed vertical stud wall or partition spaces and concealed horizontal spaces created by an assembly of floor joists or trusses, and between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings, cove ceilings and similar locations.

718.2.4 Stairways. *Fireblocking* shall be provided in concealed spaces between *stair* stringers at the top and bottom of the run. Enclosed spaces under *stairways* shall comply with Section 1011.7.3.

718.2.5 Ceiling and floor openings. Where required by Section 712.1.8, Exception 1 of Section 714.4.1.2 or Section 714.5, *fireblocking* of the *annular space* around vents, pipes, ducts, chimneys and fireplaces at ceilings and floor levels shall be installed with a material specifically tested in the form and manner intended for use to demonstrate its ability to remain in place and resist the free passage of flame and the products of combustion.

718.2.5.1 Factory-built chimneys and fireplaces. Factory-built chimneys and fireplaces shall be fireblocked in accordance with UL 103 and UL 127.

718.2.6 Exterior wall coverings. *Fireblocking* shall be installed within concealed spaces of exterior wall coverings and other exterior architectural elements where permitted to be of combustible construction as specified in Section 1406 or where erected with combustible frames. *Fireblocking* shall be installed at maximum intervals of 20 feet (6096 mm) in either dimension so that there will be no concealed space exceeding 100 square feet (9.3 m²) between *fireblocking*. Where wood furring strips are used, they shall be of approved wood of natural decay resistance or preservative-treated wood. If noncontinuous, such elements shall have closed ends, with not less than 4 inches (102 mm) of separation between sections.

Exceptions:

1. *Fireblocking* of cornices is not required in single-family *dwelling*s. *Fireblocking* of cornices of a

two-family *dwelling* is required only at the line of *dwelling unit* separation.

2. *Fireblocking* shall not be required where the exterior wall covering is installed on noncombustible framing and the face of the exterior wall covering exposed to the concealed space is covered by one of the following materials:
 - 2.1. Aluminum having a minimum thickness of 0.019 inch (0.5 mm).
 - 2.2. Corrosion-resistant steel having a base metal thickness not less than 0.016 inch (0.4 mm) at any point.
 - 2.3. Other *approved* noncombustible materials.
3. *Fireblocking* shall not be required where the exterior wall covering has been tested in accordance with, and complies with the acceptance criteria of, NFPA 285. The exterior wall covering shall be installed as tested in accordance with NFPA 285.

718.2.7 Concealed sleeper spaces. Where wood sleepers are used for laying wood flooring on masonry or concrete fire-resistance-rated floors, the space between the floor slab and the underside of the wood flooring shall be filled with an *approved* material to resist the free passage of flame and products of combustion or fireblocked in such a manner that there will be no open spaces under the flooring that will exceed 100 square feet (9.3 m²) in area and such space shall be filled solidly under permanent partitions so that there is no communication under the flooring between adjoining rooms.

Exceptions:

1. *Fireblocking* is not required for slab-on-grade floors in gymnasiums.
2. *Fireblocking* is required only at the juncture of each alternate lane and at the ends of each lane in a bowling facility.

718.3 Draftstopping in floors. In combustible construction, draftstopping shall be installed to subdivide floor/ceiling assemblies in the locations prescribed in Sections 718.3.2 through 718.3.3.

718.3.1 Draftstopping materials. Draftstopping materials shall be not less than 1/2-inch (12.7 mm) gypsum board, 3/8-inch (9.5 mm) wood structural panel, 3/8-inch (9.5 mm) particleboard, 1-inch (25-mm) nominal lumber, cement fiberboard, batts or blankets of *mineral wool* or glass fiber, or other *approved* materials adequately supported. The integrity of *draftstops* shall be maintained.

718.3.2 Groups R-1, R-2, R-3 and R-4. Draftstopping shall be provided in floor/ceiling spaces in Group R-1 buildings, in Group R-2 buildings with three or more *dwelling units*, in Group R-3 buildings with two *dwelling units* and in Group R-4 buildings. Draftstopping shall be

located above and in line with the *dwelling unit* and *sleeping unit* separations.

Exceptions:

1. Draftstopping is not required in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
2. Draftstopping is not required in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.2, provided that automatic sprinklers are installed in the combustible concealed spaces where the draftstopping is being omitted.

718.3.3 Other groups. In other groups, draftstopping shall be installed so that horizontal floor areas do not exceed 1,000 square feet (93 m²).

Exception: Draftstopping is not required in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

718.4 Draftstopping in attics. In combustible construction, draftstopping shall be installed to subdivide *attic* spaces and concealed roof spaces in the locations prescribed in Sections 718.4.2 and 718.4.3. Ventilation of concealed roof spaces shall be maintained in accordance with Section 1203.2.

718.4.1 Draftstopping materials. Materials utilized for draftstopping of *attic* spaces shall comply with Section 718.3.1.

718.4.1.1 Openings. Openings in the partitions shall be protected by *self-closing* doors with automatic latches constructed as required for the partitions.

718.4.2 Groups R-1 and R-2. Draftstopping shall be provided in *attics*, mansards, overhangs or other concealed roof spaces of Group R-2 buildings with three or more *dwelling units* and in all Group R-1 buildings. Draftstopping shall be installed above, and in line with, *sleeping unit* and *dwelling unit* separation walls that do not extend to the underside of the roof sheathing above.

Exceptions:

1. Where *corridor* walls provide a *sleeping unit* or *dwelling unit* separation, draftstopping shall only be required above one of the *corridor* walls.
2. Draftstopping is not required in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
3. In occupancies in Group R-2 that do not exceed four *stories above grade plane*, the *attic* space shall be subdivided by *draftstops* into areas not exceeding 3,000 square feet (279 m²) or above every two *dwelling units*, whichever is smaller.
4. Draftstopping is not required in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.2, provided that automatic sprinklers are installed in the combustible concealed space where the draftstopping is being omitted.

718.4.3 Other groups. Draftstopping shall be installed in *attics* and concealed roof spaces, such that any horizontal area does not exceed 3,000 square feet (279 m²).

Exception: Draftstopping is not required in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

718.5 Combustible materials in concealed spaces in Type I or II construction. Combustible materials shall not be permitted in concealed spaces of buildings of Type I or II construction.

Exceptions:

1. Combustible materials in accordance with Section 603.
2. Combustible materials exposed within plenums complying with Section 602 of the *Mechanical Code*.
3. Class A *interior finish* materials classified in accordance with Section 803.
4. Combustible piping within partitions or shaft enclosures installed in accordance with the provisions of this code.
5. Combustible piping within concealed ceiling spaces installed in accordance with the *Mechanical Code* and the *Plumbing Code*.
6. Combustible insulation and covering on pipe and tubing, installed in concealed spaces other than plenums, complying with Section 720.7.

SECTION 719 FIRE-RESISTANCE REQUIREMENTS FOR PLASTER

719.1 Thickness of plaster. The minimum thickness of gypsum plaster or Portland cement plaster used in a fire-resistance-rated system shall be determined by the prescribed fire tests. The plaster thickness shall be measured from the face of the lath where applied to gypsum lath or metal lath.

719.2 Plaster equivalents. For fire-resistance purposes, $\frac{1}{2}$ inch (12.7 mm) of unsanded gypsum plaster shall be deemed equivalent to $\frac{3}{4}$ inch (19.1 mm) of one-to-three gypsum sand plaster or 1 inch (25 mm) of Portland cement sand plaster.

719.3 Noncombustible furring. In buildings of Type I and II construction, plaster shall be applied directly on concrete or masonry or on *approved* noncombustible plastering base and furring.

719.4 Double reinforcement. Plaster protection more than 1 inch (25 mm) in thickness shall be reinforced with an additional layer of *approved* lath embedded not less than $\frac{3}{4}$ inch (19.1 mm) from the outer surface and fixed securely in place.

Exception: Solid plaster partitions or where otherwise determined by fire tests.

719.5 Plaster alternatives for concrete. In reinforced concrete construction, gypsum plaster or Portland cement plaster is permitted to be substituted for $\frac{1}{2}$ inch (12.7 mm) of the required poured concrete protection, except that a minimum

thickness of $\frac{3}{8}$ inch (9.5 mm) of poured concrete shall be provided in reinforced concrete floors and 1 inch (25 mm) in reinforced concrete columns in addition to the plaster finish. The concrete base shall be prepared in accordance with Section 2510.7.

SECTION 720 THERMAL- AND SOUND-INSULATING MATERIALS

720.1 General. Insulating materials, including facings such as vapor retarders and *vapor-permeable membranes*, similar coverings and all layers of single and multilayer reflective foil insulations, shall comply with the requirements of this section. Where a flame spread index or a smoke-developed index is specified in this section, such index shall be determined in accordance with ASTM E84 or UL 723. Any material that is subject to an increase in flame spread index or smoke-developed index beyond the limits herein established through the effects of age, moisture or other atmospheric conditions shall not be permitted.

Exceptions:

1. Fiberboard insulation shall comply with Chapter 23.
2. Foam plastic insulation shall comply with Chapter 26.
3. Duct and pipe insulation and duct and pipe coverings and linings in plenums shall comply with the *Mechanical Code*.
4. All layers of single and multilayer reflective plastic core insulation shall comply with Section 2613.

720.2 Concealed installation. Insulating materials, where concealed as installed in buildings of any type of construction, shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450.

Exception: Cellulosic fiber loose-fill insulation complying with the requirements of Section 720.6 shall not be required to meet a flame spread index requirement but shall be required to meet a smoke-developed index of not more than 450 when tested in accordance with CAN/ULC S102.2.

720.2.1 Facings. Where such materials are installed in concealed spaces in buildings of Type III, IV or V construction, the flame spread and smoke-developed limitations do not apply to facings, coverings, and layers of reflective foil insulation that are installed behind and in substantial contact with the unexposed surface of the ceiling, wall or floor finish.

Exception: All layers of single and multilayer reflective plastic core insulation shall comply with Section 2613.

720.3 Exposed installation. Insulating materials, where exposed as installed in buildings of any type of construction, shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450.

Exception: Cellulosic fiber loose-fill insulation complying with the requirements of Section 720.6 shall not be required to meet a flame spread index requirement but

shall be required to meet a smoke-developed index of not more than 450 when tested in accordance with CAN/ULC S102.2.

720.3.1 Attic floors. Exposed insulation materials installed on *attic* floors shall have a critical radiant flux of not less than 0.12 watt per square centimeter when tested in accordance with ASTM E970.

720.4 Loose-fill insulation. Loose-fill insulation materials that cannot be mounted in the ASTM E84 or UL 723 apparatus without a screen or artificial supports shall comply with the flame spread and smoke-developed limits of Sections 720.2 and 720.3 when tested in accordance with CAN/ULC S102.2.

Exception: Cellulosic fiber loose-fill insulation shall not be required to meet a flame spread index requirement when tested in accordance with CAN/ULC S102.2, provided such insulation has a smoke-developed index of not more than 450 and complies with the requirements of Section 720.6.

720.5 Roof insulation. The use of combustible roof insulation not complying with Sections 720.2 and 720.3 shall be permitted in any type of construction provided that insulation is covered with *approved* roof coverings directly applied thereto.

720.6 Cellulosic fiber loose-fill insulation and self-supported spray-applied cellulosic insulation. Cellulosic fiber loose-fill insulation and self-supported spray-applied cellulosic insulation shall comply with CPSC 16 CFR Parts 1209 and 1404. Each package of such insulating material shall be clearly labeled in accordance with CPSC 16 CFR Parts 1209 and 1404.

720.7 Insulation and covering on pipe and tubing. Insulation and covering on pipe and tubing shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450.

Exception: Insulation and covering on pipe and tubing installed in plenums shall comply with the *Mechanical Code*.

SECTION 721 PRESCRIPTIVE FIRE RESISTANCE

721.1 General. The provisions of this section contain prescriptive details of fire-resistance-rated building elements, components or assemblies. The materials of construction listed in Tables 721.1(1), 721.1(2), and 721.1(3) shall be assumed to have the *fire-resistance ratings* prescribed therein. Where materials that change the capacity for heat dissipation are incorporated into a fire-resistance-rated assembly, fire test results or other substantiating data shall be made

available to the *building official* to show that the required fire-resistance-rating time period is not reduced.

721.1.1 Thickness of protective coverings. The thickness of fire-resistant materials required for protection of structural members shall be not less than set forth in Table 721.1(1), except as modified in this section. The figures shown shall be the net thickness of the protecting materials and shall not include any hollow space in back of the protection.

721.1.2 Unit masonry protection. Where required, metal ties shall be embedded in bed joints of unit masonry for protection of steel columns. Such ties shall be as set forth in Table 721.1(1) or be equivalent thereto.

721.1.3 Reinforcement for cast-in-place concrete column protection. Cast-in-place concrete protection for steel columns shall be reinforced at the edges of such members with wire ties of not less than 0.18 inch (4.6 mm) in diameter wound spirally around the columns on a pitch of not more than 8 inches (203 mm) or by equivalent reinforcement.

721.1.4 Plaster application. The finish coat is not required for plaster protective coatings where those coatings comply with the design mix and thickness requirements of Tables 721.1(1), 721.1(2) and 721.1(3).

721.1.5 Bonded prestressed concrete tendons. For members having a single tendon or more than one tendon installed with equal concrete cover measured from the nearest surface, the cover shall be not less than that set forth in Table 721.1(1). For members having multiple tendons installed with variable concrete cover, the average tendon cover shall be not less than that set forth in Table 721.1(1), provided:

1. The clearance from each tendon to the nearest exposed surface is used to determine the average cover.
2. In no case can the clear cover for individual tendons be less than one-half of that set forth in Table 721.1(1). A minimum cover of $\frac{3}{4}$ inch (19.1 mm) for slabs and 1 inch (25 mm) for beams is required for any aggregate concrete.
3. For the purpose of establishing a *fire-resistance rating*, tendons having a clear covering less than that set forth in Table 721.1(1) shall not contribute more than 50 percent of the required ultimate moment capacity for members less than 350 square inches (0.226 m²) in cross-sectional area and 65 percent for larger members. For structural design purposes, however, tendons having a reduced cover are assumed to be fully effective.

TABLE 721.1(1)
MINIMUM PROTECTION OF STRUCTURAL PARTS BASED ON TIME PERIODS
FOR VARIOUS NONCOMBUSTIBLE INSULATING MATERIALS^m

| STRUCTURAL PARTS TO BE PROTECTED | ITEM NUMBER | INSULATING MATERIAL USED | MINIMUM THICKNESS OF INSULATING MATERIAL FOR THE FOLLOWING FIRE-RESISTANCE PERIODS (inches) | | | |
|---|-------------|---|---|---------|-----------------|--------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour |
| 1. Steel columns and all of primary trusses (continued) | 1-1.1 | Carbonate, lightweight and sand-lightweight aggregate concrete, members 6" × 6" or greater (not including sandstone, granite and siliceous gravel). ^a | 2½ | 2 | 1½ | 1 |
| | 1-1.2 | Carbonate, lightweight and sand-lightweight aggregate concrete, members 8" × 8" or greater (not including sandstone, granite and siliceous gravel). ^a | 2 | 1½ | 1 | 1 |
| | 1-1.3 | Carbonate, lightweight and sand-lightweight aggregate concrete, members 12" × 12" or greater (not including sandstone, granite and siliceous gravel). ^a | 1½ | 1 | 1 | 1 |
| | 1-1.4 | Siliceous aggregate concrete and concrete excluded in Item 1-1.1, members 6" × 6" or greater. ^a | 3 | 2 | 1½ | 1 |
| | 1-1.5 | Siliceous aggregate concrete and concrete excluded in Item 1-1.1, members 8" × 8" or greater. ^a | 2½ | 2 | 1 | 1 |
| | 1-1.6 | Siliceous aggregate concrete and concrete excluded in Item 1-1.1, members 12" × 12" or greater. ^a | 2 | 1 | 1 | 1 |
| | 1-2.1 | Clay or shale brick with brick and mortar fill. ^a | 3¾ | — | — | 2¼ |
| | 1-3.1 | 4" hollow clay tile in two 2" layers; ½" mortar between tile and column; ⅜" metal mesh 0.046" wire diameter in horizontal joints; tile fill. ^a | 4 | — | — | — |
| | 1-3.2 | 2" hollow clay tile; ¾" mortar between tile and column; ⅜" metal mesh 0.046" wire diameter in horizontal joints; limestone concrete fill ^a ; plastered with ¾" gypsum plaster. | 3 | — | — | — |
| | 1-3.3 | 2" hollow clay tile with outside wire ties 0.08" diameter at each course of tile or ⅜" metal mesh 0.046" diameter wire in horizontal joints; limestone or trap-rock concrete fill ^a extending 1" outside column on all sides. | — | — | 3 | — |
| | 1-3.4 | 2" hollow clay tile with outside wire ties 0.08" diameter at each course of tile with or without concrete fill; ¾" mortar between tile and column. | — | — | — | 2 |
| | 1-4.1 | Cement plaster over metal lath wire tied to ¾" cold-rolled vertical channels with 0.049" (No. 18 B.W. gage) wire ties spaced 3" to 6" on center. Plaster mixed 1:2 ½ by volume, cement to sand. | — | — | 2½ ^b | 7/8 |
| | 1-5.1 | Vermiculite concrete, 1:4 mix by volume over paperbacked wire fabric lath wrapped directly around column with additional 2" × 2" 0.065"/0.065" (No. 16/16 B.W. gage) wire fabric placed ¾" from outer concrete surface. Wire fabric tied with 0.049" (No. 18 B.W. gage) wire spaced 6" on center for inner layer and 2" on center for outer layer. | 2 | — | — | — |
| | 1-6.1 | Perlite or vermiculite gypsum plaster over metal lath wrapped around column and furred 1¼" from column flanges. Sheets lapped at ends and tied at 6" intervals with 0.049" (No. 18 B.W. gage) tie wire. Plaster pushed through to flanges. | 1½ | 1 | — | — |
| | 1-6.2 | Perlite or vermiculite gypsum plaster over self-furring metal lath wrapped directly around column, lapped 1" and tied at 6" intervals with 0.049" (No. 18 B.W. gage) wire. | 1¾ | 1⅜ | 1 | — |
| | 1-6.3 | Perlite or vermiculite gypsum plaster on metal lath applied to ¾" cold-rolled channels spaced 24" apart vertically and wrapped flatwise around column. | 1½ | — | — | — |
| | 1-6.4 | Perlite or vermiculite gypsum plaster over two layers of ½" plain full-length gypsum lath applied tight to column flanges. Lath wrapped with 1" hexagonal mesh of No. 20 gage wire and tied with doubled 0.035" diameter (No. 18 B.W. gage) wire ties spaced 23" on center. For three-coat work, the plaster mix for the second coat shall not exceed 100 pounds of gypsum to 2½ cubic feet of aggregate for the 3-hour system. | 2½ | 2 | — | — |

(continued)

TABLE 721.1(1)—continued
MINIMUM PROTECTION OF STRUCTURAL PARTS BASED ON TIME PERIODS
FOR VARIOUS NONCOMBUSTIBLE INSULATING MATERIALS^m

| STRUCTURAL PARTS TO BE PROTECTED | ITEM NUMBER | INSULATING MATERIAL USED | MINIMUM THICKNESS OF INSULATING MATERIAL FOR THE FOLLOWING FIRE-RESISTANCE PERIODS (inches) | | | |
|---|-------------|--|---|----------------|-----------------------------|---------------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour |
| 1. Steel columns and all of primary trusses | 1-6.5 | Perlite or vermiculite gypsum plaster over one layer of $\frac{1}{2}$ " plain full-length gypsum lath applied tight to column flanges. Lath tied with doubled 0.049" (No. 18 B.W. gage) wire ties spaced 23" on center and scratch coat wrapped with 1" hexagonal mesh 0.035" (No. 20 B.W. gage) wire fabric. For three-coat work, the plaster mix for the second coat shall not exceed 100 pounds of gypsum to $2\frac{1}{2}$ cubic feet of aggregate. | — | 2 | — | — |
| | 1-7.1 | Multiple layers of $\frac{1}{2}$ " gypsum wallboard ^c adhesively ^d secured to column flanges and successive layers. Wallboard applied without horizontal joints. Corner edges of each layer staggered. Wallboard layer below outer layer secured to column with doubled 0.049" (No. 18 B.W. gage) steel wire ties spaced 15" on center. Exposed corners taped and treated. | — | — | 2 | 1 |
| | 1-7.2 | Three layers of $\frac{5}{8}$ " Type X gypsum wallboard. ^c First and second layer held in place by $\frac{1}{8}$ " diameter by $1\frac{3}{8}$ " long ring shank nails with $\frac{5}{16}$ " diameter heads spaced 24" on center at corners. Middle layer also secured with metal straps at mid-height and 18" from each end, and by metal corner bead at each corner held by the metal straps. Third layer attached to corner bead with 1" long gypsum wallboard screws spaced 12" on center. | — | — | $1\frac{7}{8}$ | — |
| | 1-7.3 | Three layers of $\frac{5}{8}$ " Type X gypsum wallboard, ^c each layer screw attached to $1\frac{5}{8}$ " steel studs 0.018" thick (No. 25 carbon sheet steel gage) at each corner of column. Middle layer also secured with 0.049" (No. 18 B.W. gage) double-strand steel wire ties, 24" on center. Screws are No. 6 by 1" spaced 24" on center for inner layer, No. 6 by $1\frac{5}{8}$ " spaced 12" on center for middle layer and No. 8 by $2\frac{1}{4}$ " spaced 12" on center for outer layer. | — | $1\frac{7}{8}$ | — | — |
| | 1-8.1 | Wood-fibered gypsum plaster mixed 1:1 by weight gypsum-to-sand aggregate applied over metal lath. Lath lapped 1" and tied 6" on center at all end, edges and spacers with 0.049" (No. 18 B.W. gage) steel tie wires. Lath applied over $\frac{1}{2}$ " spacers made of $\frac{3}{4}$ " furring channel with 2" legs bent around each corner. Spacers located 1" from top and bottom of member and a maximum of 40" on center and wire tied with a single strand of 0.049" (No. 18 B.W. gage) steel tie wires. Corner bead tied to the lath at 6" on center along each corner to provide plaster thickness. | — | — | $1\frac{5}{8}$ | — |
| | 1-9.1 | Minimum W8x35 wide flange steel column (w/d ≥ 0.75) with each web cavity filled even with the flange tip with normal weight carbonate or siliceous aggregate concrete (3,000 psi minimum compressive strength with 145 pcf ± 3 pcf unit weight). Reinforce the concrete in each web cavity with a minimum No. 4 deformed reinforcing bar installed vertically and centered in the cavity, and secured to the column web with a minimum No. 2 horizontal deformed reinforcing bar welded to the web every 18" on center vertically. As an alternative to the No. 4 rebar, $\frac{3}{4}$ " diameter by 3" long headed studs, spaced at 12" on center vertically, shall be welded on each side of the web mid-way between the column flanges. | — | — | — | See Note n |
| 2. Webs or flanges of steel beams and girders (continued) | 2-1.1 | Carbonate, lightweight and sand-lightweight aggregate concrete (not including sand-stone, granite and siliceous gravel) with 3" or finer metal mesh placed 1" from the finished surface anchored to the top flange and providing not less than 0.025 square inch of steel area per foot in each direction. | 2 | $1\frac{1}{2}$ | 1 | 1 |
| | 2-1.2 | Siliceous aggregate concrete and concrete excluded in Item 2-1.1 with 3" or finer metal mesh placed 1" from the finished surface anchored to the top flange and providing not less than 0.025 square inch of steel area per foot in each direction. | $2\frac{1}{2}$ | 2 | $1\frac{1}{2}$ | 1 |
| | 2-2.1 | Cement plaster on metal lath attached to $\frac{3}{4}$ " cold-rolled channels with 0.04" (No. 18 B.W. gage) wire ties spaced 3" to 6" on center. Plaster mixed 1:2 $\frac{1}{2}$ by volume, cement to sand. | — | — | $2\frac{1}{2}$ ^b | $\frac{7}{8}$ |

(continued)

TABLE 721.1(1)—continued
MINIMUM PROTECTION OF STRUCTURAL PARTS BASED ON TIME PERIODS
FOR VARIOUS NONCOMBUSTIBLE INSULATING MATERIALS^m

| STRUCTURAL PARTS TO BE PROTECTED | ITEM NUMBER | INSULATING MATERIAL USED | MINIMUM THICKNESS OF INSULATING MATERIAL FOR THE FOLLOWING FIRE-RESISTANCE PERIODS (inches) | | | |
|--|-------------|--|---|----------------|---------|--------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour |
| 2. Webs or flanges of steel beams and girders | 2-3.1 | Vermiculite gypsum plaster on a metal lath cage, wire tied to 0.165" diameter (No. 8 B.W. gage) steel wire hangers wrapped around beam and spaced 16" on center. Metal lath ties spaced approximately 5" on center at cage sides and bottom. | — | 7/8 | — | — |
| | 2-4.1 | Two layers of 5/8" Type X gypsum wallboard ^c are attached to U-shaped brackets spaced 24" on center. 0.018" thick (No. 25 carbon sheet steel gage) 1 5/8" deep by 1" galvanized steel runner channels are first installed parallel to and on each side of the top beam flange to provide a 1/2" clearance to the flange. The channel runners are attached to steel deck or concrete floor construction with approved fasteners spaced 12" on center. U-shaped brackets are formed from members identical to the channel runners. At the bent portion of the U-shaped bracket, the flanges of the channel are cut out so that 1 5/8" deep corner channels can be inserted without attachment parallel to each side of the lower flange. As an alternative, 0.021" thick (No. 24 carbon sheet steel gage) 1" × 2" runner and corner angles shall be used in lieu of channels, and the web cutouts in the U-shaped brackets shall not be required. Each angle is attached to the bracket with 1/2"-long No. 8 self-drilling screws. The vertical legs of the U-shaped bracket are attached to the runners with one 1/2" long No. 8 self-drilling screw. The completed steel framing provides a 2 1/8" and 1 1/2" space between the inner layer of wallboard and the sides and bottom of the steel beam, respectively. The inner layer of wallboard is attached to the top runners and bottom corner channels or corner angles with 1 1/4"-long No. 6 self-drilling screws spaced 16" on center. The outer layer of wallboard is applied with 1 3/4"-long No. 6 self-drilling screws spaced 8" on center. The bottom corners are reinforced with metal corner beads. | — | — | 1 1/4 | — |
| | 2-4.2 | Three layers of 5/8" Type X gypsum wallboard ^c attached to a steel suspension system as described immediately above utilizing the 0.018" thick (No. 25 carbon sheet steel gage) 1" × 2" lower corner angles. The framing is located so that a 2 1/8" and 2" space is provided between the inner layer of wallboard and the sides and bottom of the beam, respectively. The first two layers of wallboard are attached as described immediately above. A layer of 0.035" thick (No. 20 B.W. gage) 1" hexagonal galvanized wire mesh is applied under the soffit of the middle layer and up the sides approximately 2". The mesh is held in position with the No. 6 1 5/8"-long screws installed in the vertical leg of the bottom corner angles. The outer layer of wallboard is attached with No. 6 2 1/4"-long screws spaced 8" on center. One screw is also installed at the mid-depth of the bracket in each layer. Bottom corners are finished as described above. | — | 1 7/8 | — | — |
| 3. Bonded pre-tensioned reinforcement in prestressed concrete ^c | 3-1.1 | Carbonate, lightweight, sand-lightweight and siliceous ^f aggregate concrete Beams or girders | 4 ^g | 3 ^g | 2 1/2 | 1 1/2 |
| | | Solid ^h | | 2 | 1 1/2 | 1 |

(continued)

TABLE 721.1(1) —continued
MINIMUM PROTECTION OF STRUCTURAL PARTS BASED ON TIME PERIODS
FOR VARIOUS NONCOMBUSTIBLE INSULATING MATERIALS^m

| STRUCTURAL PARTS TO BE PROTECTED | ITEM NUMBER | INSULATING MATERIAL USED | MINIMUM THICKNESS OF INSULATING MATERIAL FOR THE FOLLOWING FIRE-RESISTANCE PERIODS (inches) | | | |
|---|-------------|--|---|-------------------------|---------------------------|-------------------------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour |
| 4. Bonded or unbonded post-tensioned tendons in pre-stressed concrete ^{e, i} | 4-1.1 | Carbonate, lightweight, sand-lightweight and siliceous ^f aggregate concrete Unrestrained members: Solid slabs ^h Beams and girders ^j 8" wide greater than 12" wide | — 3 | 2 4 1/2 2 1/2 | 1 1/2 2 1/2 2 | — 1 3/4 1 1/2 |
| | 4-1.2 | Carbonate, lightweight, sand-lightweight and siliceous aggregate Restrained members: ^k Solid slabs ^h Beams and girders ^j 8" wide greater than 12" wide | 1 1/4 2 1/2 2 | 1 2 1 3/4 | 3/4 1 3/4 1 1/2 | — — — |
| 5. Reinforcing steel in reinforced concrete columns, beams girders and trusses | 5-1.1 | Carbonate, lightweight and sand-lightweight aggregate concrete, members 12" or larger, square or round. (Size limit does not apply to beams and girders monolithic with floors.) Siliceous aggregate concrete, members 12" or larger, square or round. (Size limit does not apply to beams and girders monolithic with floors.) | 1 1/2 2 | 1 1/2 1 1/2 | 1 1/2 1 1/2 | 1 1/2 1 1/2 |
| 6. Reinforcing steel in reinforced concrete joists ^l | 6-1.1 | Carbonate, lightweight and sand-lightweight aggregate concrete | 1 1/4 | 1 1/4 | 1 | 3/4 |
| | 6-1.2 | Siliceous aggregate concrete | 1 3/4 | 1 1/2 | 1 | 3/4 |
| 7. Reinforcing and tie rods in floor and roof slabs ^l | 7-1.1 | Carbonate, lightweight and sand-lightweight aggregate concrete | 1 | 1 | 3/4 | 3/4 |
| | 7-1.2 | Siliceous aggregate concrete | 1 1/4 | 1 | 1 | 3/4 |

For SI: 1 inch = 25.4 mm, 1 square inch = 645.2 mm², 1 cubic foot = 0.0283 m³, 1 pound per cubic foot = 16.02 kg/m³.

- a. Reentrant parts of protected members to be filled solidly.
- b. Two layers of equal thickness with a 3/4-inch airspace between.
- c. For all of the construction with gypsum wallboard described in Table 721.1(1), gypsum base for veneer plaster of the same size, thickness and core type shall be permitted to be substituted for gypsum wallboard, provided attachment is identical to that specified for the wallboard and the joints on the face layer are reinforced, and the entire surface is covered with not less than 1/16-inch gypsum veneer plaster.
- d. An approved adhesive qualified under ASTM E119 or UL 263.
- e. Where lightweight or sand-lightweight concrete having an oven-dry weight of 110 pounds per cubic foot or less is used, the tabulated minimum cover shall be permitted to be reduced 25 percent, except that in no case shall the cover be less than 3/4 inch in slabs or 1 1/2 inches in beams or girders.
- f. For solid slabs of siliceous aggregate concrete, increase tendon cover 20 percent.
- g. Adequate provisions against spalling shall be provided by U-shaped or hooped stirrups spaced not to exceed the depth of the member with a clear cover of 1 inch.
- h. Prestressed slabs shall have a thickness not less than that required in Table 721.1(3) for the respective fire-resistance time period.
- i. Fire coverage and end anchorages shall be as follows: Cover to the prestressing steel at the anchor shall be 1/2 inch greater than that required away from the anchor. Minimum cover to steel-bearing plate shall be 1 inch in beams and 3/4 inch in slabs.
- j. For beam widths between 8 inches and 12 inches, cover thickness shall be permitted to be determined by interpolation.
- k. Interior spans of continuous slabs, beams and girders shall be permitted to be considered restrained.
- l. For use with concrete slabs having a comparable fire endurance where members are framed into the structure in such a manner as to provide equivalent performance to that of monolithic concrete construction.
- m. Generic *fire-resistance ratings* (those not designated as PROPRIETARY* in the listing) in GA 600 shall be accepted as if herein listed.
- n. No additional insulating material is required on the exposed outside face of the column flange to achieve a 1-hour *fire-resistance rating*.

TABLE 721.1(2)
RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS ^{a, o, p}

| MATERIAL | ITEM NUMBER | CONSTRUCTION | MINIMUM FINISHED THICKNESS FACE-TO-FACE ^b (inches) | | | |
|--|-----------------------|---|---|-----------------|-----------------|-----------------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour |
| 1. Brick of clay or shale | 1-1.1 | Solid brick of clay or shale ^c . | 6 | 4.9 | 3.8 | 2.7 |
| | 1-1.2 | Hollow brick, not filled. | 5.0 | 4.3 | 3.4 | 2.3 |
| | 1-1.3 | Hollow brick unit wall, grout or filled with perlite vermiculite or expanded shale aggregate. | 6.6 | 5.5 | 4.4 | 3.0 |
| | 1-2.1 | 4" nominal thick units not less than 75 percent solid backed with a hat-shaped metal furring channel $\frac{3}{4}$ " thick formed from 0.021" sheet metal attached to the brick wall on 24" centers with approved fasteners, and $\frac{1}{2}$ " Type X gypsum wallboard attached to the metal furring strips with 1"-long Type S screws spaced 8" on center. | — | — | 5 ^d | — |
| 2. Combination of clay brick and load-bearing hollow clay tile | 2-1.1 | 4" solid brick and 4" tile (not less than 40 percent solid). | — | 8 | — | — |
| | 2-1.2 | 4" solid brick and 8" tile (not less than 40 percent solid). | 12 | — | — | — |
| 3. Concrete masonry units | 3-1.1 ^{f, g} | Expanded slag or pumice. | 4.7 | 4.0 | 3.2 | 2.1 |
| | 3-1.2 ^{f, g} | Expanded clay, shale or slate. | 5.1 | 4.4 | 3.6 | 2.6 |
| | 3-1.3 ^f | Limestone, cinders or air-cooled slag. | 5.9 | 5.0 | 4.0 | 2.7 |
| | 3-1.4 ^{f, g} | Calcareous or siliceous gravel. | 6.2 | 5.3 | 4.2 | 2.8 |
| 4. Solid concrete ^{h, i} | 4-1.1 | Siliceous aggregate concrete. | 7.0 | 6.2 | 5.0 | 3.5 |
| | | Carbonate aggregate concrete. | 6.6 | 5.7 | 4.6 | 3.2 |
| | | Sand-lightweight concrete. | 5.4 | 4.6 | 3.8 | 2.7 |
| | | Lightweight concrete. | 5.1 | 4.4 | 3.6 | 2.5 |
| 5. Glazed or unglazed facing tile, nonload-bearing | 5-1.1 | One 2" unit cored 15 percent maximum and one 4" unit cored 25 percent maximum with $\frac{3}{4}$ " mortar-filled collar joint. Unit positions reversed in alternate courses. | — | 6 $\frac{3}{8}$ | — | — |
| | 5-1.2 | One 2" unit cored 15 percent maximum and one 4" unit cored 40 percent maximum with $\frac{3}{4}$ " mortar-filled collar joint. Unit positions side with $\frac{3}{4}$ " gypsum plaster. Two wythes tied together every fourth course with No. 22 gage corrugated metal ties. | — | 6 $\frac{3}{4}$ | — | — |
| | 5-1.3 | One unit with three cells in wall thickness, cored 29 percent maximum. | — | — | 6 | — |
| | 5-1.4 | One 2" unit cored 22 percent maximum and one 4" unit cored 41 percent maximum with $\frac{1}{4}$ " mortar-filled collar joint. Two wythes tied together every third course with 0.030" (No. 22 galvanized sheet steel gage) corrugated metal ties. | — | — | 6 | — |
| | 5-1.5 | One 4" unit cored 25 percent maximum with $\frac{3}{4}$ " gypsum plaster on one side. | — | — | 4 $\frac{3}{4}$ | — |
| | 5-1.6 | One 4" unit with two cells in wall thickness, cored 22 percent maximum. | — | — | — | 4 |
| | 5-1.7 | One 4" unit cored 30 percent maximum with $\frac{3}{4}$ " vermiculite gypsum plaster on one side. | — | — | 4 $\frac{1}{2}$ | — |
| | 5-1.8 | One 4" unit cored 39 percent maximum with $\frac{3}{4}$ " gypsum plaster on one side. | — | — | — | 4 $\frac{1}{2}$ |

(continued)

TABLE 721.1(2)—continued
RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS ^{a, o, p}

| MATERIAL | ITEM NUMBER | CONSTRUCTION | MINIMUM FINISHED THICKNESS FACE-TO-FACE ^b (inches) | | | |
|--|-------------|---|---|---------|-----------------|-----------------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour |
| 6. Solid gypsum plaster | 6-1.1 | $\frac{3}{4}$ " by 0.055" (No. 16 carbon sheet steel gage) vertical cold-rolled channels, 16" on center with 2.6-pound flat metal lath applied to one face and tied with 0.049" (No. 18 B.W. gage) wire at 6" spacing. Gypsum plaster each side mixed 1:2 by weight, gypsum to sand aggregate. | — | — | — | 2 ^d |
| | 6-1.2 | $\frac{3}{4}$ " by 0.05" (No. 16 carbon sheet steel gage) cold-rolled channels 16" on center with metal lath applied to one face and tied with 0.049" (No. 18 B.W. gage) wire at 6" spacing. Perlite or vermiculite gypsum plaster each side. For three-coat work, the plaster mix for the second coat shall not exceed 100 pounds of gypsum to 2½ cubic feet of aggregate for the 1-hour system. | — | — | 2½ ^d | 2 ^d |
| | 6-1.3 | $\frac{3}{4}$ " by 0.055" (No. 16 carbon sheet steel gage) vertical cold-rolled channels, 16" on center with $\frac{3}{8}$ " gypsum lath applied to one face and attached with sheet metal clips. Gypsum plaster each side mixed 1:2 by weight, gypsum to sand aggregate. | — | — | — | 2 ^d |
| | 6-2.1 | Studless with ½" full-length plain gypsum lath and gypsum plaster each side. Plaster mixed 1:1 for scratch coat and 1:2 for brown coat, by weight, gypsum to sand aggregate. | — | — | — | 2 ^d |
| | 6-2.2 | Studless with ½" full-length plain gypsum lath and perlite or vermiculite gypsum plaster each side. | — | — | 2½ ^d | 2 ^d |
| | 6-2.3 | Studless partition with $\frac{3}{8}$ " rib metal lath installed vertically adjacent edges tied 6" on center with No. 18 gage wire ties, gypsum plaster each side mixed 1:2 by weight, gypsum to sand aggregate. | — | — | — | 2 ^d |
| 7. Solid perlite and Portland cement | 7-1.1 | Perlite mixed in the ratio of 3 cubic feet to 100 pounds of Portland cement and machine applied to stud side of 1½" mesh by 0.058-inch (No. 17 B.W. gage) paper-backed woven wire fabric lath wire-tied to 4"-deep steel trussed wire studs 16" on center. Wire ties of 0.049" (No. 18 B.W. gage) galvanized steel wire 6" on center vertically. | — | — | 3⅛ ^d | — |
| 8. Solid neat wood fibered gypsum plaster | 8-1.1 | $\frac{3}{4}$ " by 0.055-inch (No. 16 carbon sheet steel gage) cold-rolled channels, 12" on center with 2.5-pound flat metal lath applied to one face and tied with 0.049" (No. 18 B.W. gage) wire at 6" spacing. Neat gypsum plaster applied each side. | — | — | 2 ^d | — |
| 9. Solid wallboard partition | 9-1.1 | One full-length layer ½" Type X gypsum wallboard ^c laminated to each side of 1" full-length V-edge gypsum coreboard with approved laminating compound. Vertical joints of face layer and coreboard staggered not less than 3". | — | — | 2 ^d | — |
| 10. Hollow (studless) gypsum wallboard partition | 10-1.1 | One full-length layer of $\frac{5}{8}$ " Type X gypsum wallboard ^c attached to both sides of wood or metal top and bottom runners laminated to each side of 1"×6" full-length gypsum coreboard ribs spaced 2" on center with approved laminating compound. Ribs centered at vertical joints of face plies and joints staggered 24" in opposing faces. Ribs may be recessed 6" from the top and bottom. | — | — | — | 2¼ ^d |
| | 10-1.2 | 1" regular gypsum V-edge full-length backing board attached to both sides of wood or metal top and bottom runners with nails or 1⅝" drywall screws at 24" on center. Minimum width of runners 1⅝". Face layer of ½" regular full-length gypsum wallboard laminated to outer faces of backing board with approved laminating compound. | — | — | 4⅝ ^d | — |

(continued)

TABLE 721.1(2) —continued
RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS ^{a, o, p}

| MATERIAL | ITEM NUMBER | CONSTRUCTION | MINIMUM FINISHED THICKNESS FACE-TO-FACE ^b (inches) | | | |
|---|------------------------|--|---|--------------------|--------------------|--------------------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour |
| 11. Noncombustible studs-interior partition with plaster each side | 11-1.1 | 3 1/4" × 0.044" (No. 18 carbon sheet steel gage) steel studs spaced 24" on center. 5/8" gypsum plaster on metal lath each side mixed 1:2 by weight, gypsum to sand aggregate. | — | — | — | 4 3/4 ^d |
| | 11-1.2 | 3 3/8" × 0.055" (No. 16 carbon sheet steel gage) approved nailable ^k studs spaced 24" on center. 5/8" neat gypsum wood-fibered plaster each side over 3/8" rib metal lath nailed to studs with 6d common nails, 8" on center. Nails driven 1 1/4" and bent over. | — | — | 5 5/8 | — |
| | 11-1.3 | 4" × 0.044" (No. 18 carbon sheet steel gage) channel-shaped steel studs at 16" on center. On each side approved resilient clips pressed onto stud flange at 16" vertical spacing, 1/4" pencil rods snapped into or wire tied onto outer loop of clips, metal lath wire-tied to pencil rods at 6" intervals, 1" perlite gypsum plaster, each side. | — | 7 5/8 ^d | — | — |
| | 11-1.4 | 2 1/2" × 0.044" (No. 18 carbon sheet steel gage) steel studs spaced 16" on center. Wood fibered gypsum plaster mixed 1:1 by weight gypsum to sand aggregate applied on 3/4-pound metal lath wire tied to studs, each side. 3/4" plaster applied over each face, including finish coat. | — | — | 4 1/4 ^d | — |
| 12. Wood studs-interior partition with plaster each side | 12-1.1 ^{1, m} | 2" × 4" wood studs 16" on center with 5/8" gypsum plaster on metal lath. Lath attached by 4d common nails bent over or No. 14 gage by 1 1/4" by 3/4" crown width staples spaced 6" on center. Plaster mixed 1:1 1/2 for scratch coat and 1:3 for brown coat, by weight, gypsum to sand aggregate. | — | — | — | 5 1/8 |
| | 12-1.2 ¹ | 2" × 4" wood studs 16" on center with metal lath and 7/8" neat wood-fibered gypsum plaster each side. Lath attached by 6d common nails, 7" on center. Nails driven 1 1/4" and bent over. | — | — | 5 1/2 ^d | — |
| | 12-1.3 ¹ | 2" × 4" wood studs 16" on center with 3/8" perforated or plain gypsum lath and 1/2" gypsum plaster each side. Lath nailed with 1 1/8" by No. 13 gage by 19/64" head plasterboard blued nails, 4" on center. Plaster mixed 1:2 by weight, gypsum to sand aggregate. | — | — | — | 5 1/4 |
| | 12-1.4 ¹ | 2" × 4" wood studs 16" on center with 3/8" Type X gypsum lath and 1/2" gypsum plaster each side. Lath nailed with 1 1/8" by No. 13 gage by 19/64" head plasterboard blued nails, 5" on center. Plaster mixed 1:2 by weight, gypsum to sand aggregate. | — | — | — | 5 1/4 |
| 13. Noncombustible studs-interior partition with gypsum wallboard each side | 13-1.1 | 0.018" (No. 25 carbon sheet steel gage) channel-shaped studs 24" on center with one full-length layer of 5/8" Type X gypsum wallboard ^c applied vertically attached with 1"-long No. 6 drywall screws to each stud. Screws are 8" on center around the perimeter and 12" on center on the intermediate stud. Where applied horizontally, the Type X gypsum wallboard shall be attached to 3 5/8" studs and the horizontal joints shall be staggered with those on the opposite side. Screws for the horizontal application shall be 8" on center at vertical edges and 12" on center at intermediate studs. | — | — | — | 2 7/8 ^d |
| | 13-1.2 | 0.018" (No. 25 carbon sheet steel gage) channel-shaped studs 25" on center with two full-length layers of 1/2" Type X gypsum wallboard ^c applied vertically each side. First layer attached with 1"-long, No. 6 drywall screws, 8" on center around the perimeter and 12" on center on the intermediate stud. Second layer applied with vertical joints offset one stud space from first layer using 1 5/8" long, No. 6 drywall screws spaced 9" on center along vertical joints, 12" on center at intermediate studs and 24" on center along top and bottom runners. | — | — | 3 5/8 ^d | — |
| | 13-1.3 | 0.055" (No. 16 carbon sheet steel gage) approved nailable metal studs ^c 24" on center with full-length 5/8" Type X gypsum wallboard ^c applied vertically and nailed 7" on center with 6d cement-coated common nails. Approved metal fastener grips used with nails at vertical butt joints along studs. | — | — | — | 4 7/8 |

(continued)

TABLE 721.1(2)—continued
RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS ^{a, o, p}

| MATERIAL | ITEM NUMBER | CONSTRUCTION | MINIMUM FINISHED THICKNESS FACE-TO-FACE ^b (inches) | | | |
|---|------------------------|---|---|---------|---------|------------------------------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour |
| 14. Wood studs-interior partition with gypsum wallboard each side | 14-1.1 ^{h, m} | 2" × 4" wood studs 16" on center with two layers of $\frac{3}{8}$ " regular gypsum wallboard ^c each side, 4d cooler ⁿ or wallboard ⁿ nails at 8" on center first layer, 5d cooler ⁿ or wallboard ⁿ nails at 8" on center second layer with laminating compound between layers, joints staggered. First layer applied full length vertically, second layer applied horizontally or vertically. | — | — | — | 5 |
| | 14-1.2 ^{l, m} | 2" × 4" wood studs 16" on center with two layers $\frac{1}{2}$ " regular gypsum wallboard ^c applied vertically or horizontally each side ^k , joints staggered. Nail base layer with 5d cooler ⁿ or wallboard ⁿ nails at 8" on center face layer with 8d cooler ⁿ or wallboard ⁿ nails at 8" on center. | — | — | — | 5 $\frac{1}{2}$ |
| | 14-1.3 ^{l, m} | 2" × 4" wood studs 24" on center with $\frac{5}{8}$ " Type X gypsum wallboard ^c applied vertically or horizontally nailed with 6d cooler ⁿ or wallboard ⁿ nails at 7" on center with end joints on nailing members. Stagger joints each side. | — | — | — | 4 $\frac{3}{4}$ |
| | 14-1.4 ^l | 2" × 4" fire-retardant-treated wood studs spaced 24" on center with one layer of $\frac{5}{8}$ " Type X gypsum wallboard ^c applied with face paper grain (long dimension) parallel to studs. Wallboard attached with 6d cooler ⁿ or wallboard ⁿ nails at 7" on center. | — | — | — | 4 $\frac{3}{4}$ ^d |
| | 14-1.5 ^{l, m} | 2" × 4" wood studs 16" on center with two layers $\frac{5}{8}$ " Type X gypsum wallboard ^c each side. Base layers applied vertically and nailed with 6d cooler ⁿ or wallboard ⁿ nails at 9" on center. Face layer applied vertically or horizontally and nailed with 8d cooler ⁿ or wallboard ⁿ nails at 7" on center. For nail-adhesive application, base layers are nailed 6" on center. Face layers applied with coating of approved wallboard adhesive and nailed 12" on center. | — | — | 6 | — |
| | 14-1.6 ^l | 2" × 3" fire-retardant-treated wood studs spaced 24" on center with one layer of $\frac{5}{8}$ " Type X gypsum wallboard ^c applied with face paper grain (long dimension) at right angles to studs. Wallboard attached with 6d cement-coated box nails spaced 7" on center. | — | — | — | 3 $\frac{5}{8}$ ^d |
| 15. Exterior or interior walls (continued) | 15-1.1 ^{l, m} | Exterior surface with $\frac{3}{4}$ " drop siding over $\frac{1}{2}$ " gypsum sheathing on 2" × 4" wood studs at 16" on center, interior surface treatment as required for 1-hour-rated exterior or interior 2" × 4" wood stud partitions. Gypsum sheathing nailed with 1 $\frac{3}{4}$ " by No. 11 gage by $\frac{7}{16}$ " head galvanized nails at 8" on center. Siding nailed with 7d galvanized smooth box nails. | — | — | — | Varies |
| | 15-1.2 ^{l, m} | 2" × 4" wood studs 16" on center with metal lath and $\frac{3}{4}$ " cement plaster on each side. Lath attached with 6d common nails 7" on center driven to 1" minimum penetration and bent over. Plaster mix 1:4 for scratch coat and 1:5 for brown coat, by volume, cement to sand. | — | — | — | 5 $\frac{3}{8}$ |
| | 15-1.3 ^{l, m} | 2" × 4" wood studs 16" on center with $\frac{7}{8}$ " cement plaster (measured from the face of studs) on the exterior surface with interior surface treatment as required for interior wood stud partitions in this table. Plaster mix 1:4 for scratch coat and 1:5 for brown coat, by volume, cement to sand. | — | — | — | Varies |
| | 15-1.4 | 3 $\frac{5}{8}$ " No. 16 gage noncombustible studs 16" on center with $\frac{7}{8}$ " cement plaster (measured from the face of the studs) on the exterior surface with interior surface treatment as required for interior, nonbearing, noncombustible stud partitions in this table. Plaster mix 1:4 for scratch coat and 1:5 for brown coat, by volume, cement to sand. | — | — | — | Varies ^d |

(continued)

TABLE 721.1(2)—continued
RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS ^{a, o, p}

| MATERIAL | ITEM NUMBER | CONSTRUCTION | MINIMUM FINISHED THICKNESS FACE-TO-FACE ^b (inches) | | | |
|--|------------------------|--|---|---------|-------------------------------|--------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour |
| 15. Exterior or interior walls (continued) | 15-1.5 ^m | 2 ¹ / ₄ " × 3 ³ / ₄ " clay face brick with cored holes over ¹ / ₂ " gypsum sheathing on exterior surface of 2" × 4" wood studs at 16" on center and two layers ⁵ / ₈ " Type X gypsum wallboard ^c on interior surface. Sheathing placed horizontally or vertically with vertical joints over studs nailed 6" on center with 1 ³ / ₄ " × No. 11 gage by ⁷ / ₁₆ " head galvanized nails. Inner layer of wallboard placed horizontally or vertically and nailed 8" on center with 6d cooler ⁿ or wallboard ⁿ nails. Outer layer of wallboard placed horizontally or vertically and nailed 8" on center with 8d cooler ⁿ or wallboard ⁿ nails. Joints staggered with vertical joints over studs. Outer layer joints taped and finished with compound. Nail heads covered with joint compound. 0.035 inch (No. 20 galvanized sheet gage) corrugated galvanized steel wall ties ³ / ₄ " by 6 ⁵ / ₈ " attached to each stud with two 8d cooler ⁿ or wallboard ⁿ nails every sixth course of bricks. | — | — | 10 | — |
| | 15-1.6 ^{l, m} | 2" × 6" fire-retardant-treated wood studs 16" on center. Interior face has two layers of ⁵ / ₈ " Type X gypsum with the base layer placed vertically and attached with 6d box nails 12" on center. The face layer is placed horizontally and attached with 8d box nails 8" on center at joints and 12" on center elsewhere. The exterior face has a base layer of ⁵ / ₈ " Type X gypsum sheathing placed vertically with 6d box nails 8" on center at joints and 12" on center elsewhere. An approved building paper is next applied, followed by self-furred exterior lath attached with 2 ¹ / ₂ " No. 12 gage galvanized roofing nails with a ³ / ₈ " diameter head and spaced 6" on center along each stud. Cement plaster consisting of a ¹ / ₂ " brown coat is then applied. The scratch coat is mixed in the proportion of 1:3 by weight, cement to sand with 10 pounds of hydrated lime and 3 pounds of approved additives or admixtures per sack of cement. The brown coat is mixed in the proportion of 1:4 by weight, cement to sand with the same amounts of hydrated lime and approved additives or admixtures used in the scratch coat. | — | — | 8 ¹ / ₄ | — |
| | 15-1.7 ^{l, m} | 2" × 6" wood studs 16" on center. The exterior face has a layer of ⁵ / ₈ " Type X gypsum sheathing placed vertically with 6d box nails 8" on center at joints and 12" on center elsewhere. An approved building paper is next applied, followed by 1" by No. 18 gage self-furred exterior lath attached with 8d by 2 ¹ / ₂ " long galvanized roofing nails spaced 6" on center along each stud. Cement plaster consisting of a ¹ / ₂ " scratch coat, a bonding agent and a ¹ / ₂ " brown coat and a finish coat is then applied. The scratch coat is mixed in the proportion of 1:3 by weight, cement to sand with 10 pounds of hydrated lime and 3 pounds of approved additives or admixtures per sack of cement. The brown coat is mixed in the proportion of 1:4 by weight, cement to sand with the same amounts of hydrated lime and approved additives or admixtures used in the scratch coat. The interior is covered with ³ / ₈ " gypsum lath with 1" hexagonal mesh of 0.035 inch (No. 20 B.W. gage) woven wire lath furred out ⁵ / ₁₆ " and 1" perlite or vermiculite gypsum plaster. Lath nailed with 1 ¹ / ₈ " by No. 13 gage by ¹⁹ / ₆₄ " head plasterboard glued nails spaced 5" on center. Mesh attached by 1 ³ / ₄ " by No. 12 gage by ³ / ₈ " head nails with ³ / ₈ " furrings, spaced 8" on center. The plaster mix shall not exceed 100 pounds of gypsum to 2 ¹ / ₂ cubic feet of aggregate. | — | — | 8 ³ / ₈ | — |

(continued)

TABLE 721.1(2)—continued
RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS^{a, o, p}

| MATERIAL | ITEM NUMBER | CONSTRUCTION | MINIMUM FINISHED THICKNESS FACE-TO-FACE ^b (inches) | | | |
|--|------------------------|---|---|---------|-----------------------------|----------------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour |
| 15. Exterior or interior walls (continued) | 15-1.8 ^{l, m} | 2" × 6" wood studs 16" on center. The exterior face has a layer of $\frac{5}{8}$ " Type X gypsum sheathing placed vertically with 6d box nails 8" on center at joints and 12" on center elsewhere. An approved building paper is next applied, followed by $1\frac{1}{2}$ " by No. 17 gage self-furred exterior lath attached with 8d by $2\frac{1}{2}$ " long galvanized roofing nails spaced 6" on center along each stud. Cement plaster consisting of a $\frac{1}{2}$ " scratch coat, and a $\frac{1}{2}$ " brown coat is then applied. The plaster may be placed by machine. The scratch coat is mixed in the proportion of 1:4 by weight, plastic cement to sand. The brown coat is mixed in the proportion of 1:5 by weight, plastic cement to sand. The interior is covered with $\frac{3}{8}$ " gypsum lath with 1" hexagonal mesh of No. 20 gage woven wire lath furred out $\frac{5}{16}$ " and 1" perlite or vermiculite gypsum plaster. Lath nailed with $1\frac{1}{8}$ " by No. 13 gage by $\frac{19}{64}$ " head plasterboard glued nails spaced 5" on center. Mesh attached by $1\frac{3}{4}$ " by No. 12 gage by $\frac{3}{8}$ " head nails with $\frac{3}{8}$ " furrings, spaced 8" on center. The plaster mix shall not exceed 100 pounds of gypsum to $2\frac{1}{2}$ cubic feet of aggregate. | — | — | $8\frac{3}{8}$ | — |
| | 15-1.9 | 4" No. 18 gage, nonload-bearing metal studs, 16" on center, with 1" Portland cement lime plaster (measured from the back side of the $\frac{3}{4}$ -pound expanded metal lath) on the exterior surface. Interior surface to be covered with 1" of gypsum plaster on $\frac{3}{4}$ -pound expanded metal lath proportioned by weight-1:2 for scratch coat, 1:3 for brown, gypsum to sand. Lath on one side of the partition fastened to $\frac{1}{4}$ " diameter pencil rods supported by No. 20 gage metal clips, located 16" on center vertically, on each stud. 3" thick mineral fiber insulating batts friction fitted between the studs. | — | — | $6\frac{1}{2}$ ^d | — |
| | 15-1.10 | Steel studs 0.060" thick, 4" deep or 6" at 16" or 24" centers, with $\frac{1}{2}$ " Glass Fiber Reinforced Concrete (GFRC) on the exterior surface. GFRC is attached with flex anchors at 24" on center, with 5" leg welded to studs with two $\frac{1}{2}$ "-long flare-bevel welds, and 4" foot attached to the GFRC skin with $\frac{5}{8}$ " thick GFRC bonding pads that extend $2\frac{1}{2}$ " beyond the flex anchor foot on both sides. Interior surface to have two layers of $\frac{1}{2}$ " Type X gypsum wallboard. ^e The first layer of wallboard to be attached with 1"-long Type S buglehead screws spaced 24" on center and the second layer is attached with $1\frac{5}{8}$ "-long Type S screws spaced at 12" on center. Cavity is to be filled with 5" of 4 pcf (nominal) mineral fiber batts. GFRC has $1\frac{1}{2}$ " returns packed with mineral fiber and caulked on the exterior. | — | — | $6\frac{1}{2}$ | — |
| | 15-1.11 | Steel studs 0.060" thick, 4" deep or 6" at 16" or 24" centers, respectively, with $\frac{1}{2}$ " Glass Fiber Reinforced Concrete (GFRC) on the exterior surface. GFRC is attached with flex anchors at 24" on center, with 5" leg welded to studs with two $\frac{1}{2}$ "-long flare-bevel welds, and 4" foot attached to the GFRC skin with $\frac{5}{8}$ " -thick GFRC bonding pads that extend $2\frac{1}{2}$ " beyond the flex anchor foot on both sides. Interior surface to have one layer of $\frac{5}{8}$ " Type X gypsum wallboard ^e , attached with $1\frac{1}{4}$ "-long Type S buglehead screws spaced 12" on center. Cavity is to be filled with 5" of 4 pcf (nominal) mineral fiber batts. GFRC has $1\frac{1}{2}$ " returns packed with mineral fiber and caulked on the exterior. | — | — | — | $6\frac{1}{8}$ |
| | 15-1.12 ^q | 2" × 6" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with $\frac{5}{8}$ " Type X gypsum wallboard, 4' wide, applied horizontally or vertically with vertical joints over studs, and fastened with $2\frac{1}{4}$ " Type S drywall screws, spaced 12" on center. Cavity to be filled with $5\frac{1}{2}$ " mineral wool insulation. | — | — | — | $6\frac{3}{4}$ |

(continued)

TABLE 721.1(2)—continued
RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS ^{a, o, p}

| MATERIAL | ITEM NUMBER | CONSTRUCTION | MINIMUM FINISHED THICKNESS FACE-TO-FACE ^b (inches) | | | |
|--|----------------------|--|---|---------|-----------------|-----------------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour |
| 15. Exterior or interior walls (continued) | 15-1.13 ^q | 2" × 6" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with $\frac{5}{8}$ " Type X gypsum wallboard, 4' wide, applied vertically with all joints over framing or blocking and fastened with $2\frac{1}{4}$ " Type S drywall screws, spaced 12" on center. R-19 mineral fiber insulation installed in stud cavity. | — | — | — | 6 $\frac{3}{4}$ |
| | 15-1.14 ^q | 2" × 6" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with $\frac{5}{8}$ " Type X gypsum wallboard, 4' wide, applied horizontally or vertically with vertical joints over studs, and fastened with $2\frac{1}{4}$ " Type S drywall screws, spaced 7" on center. | — | — | — | 6 $\frac{3}{4}$ |
| | 15-1.15 ^q | 2" × 4" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with $\frac{5}{8}$ " Type X gypsum wallboard and sheathing, respectively, 4' wide, applied horizontally or vertically with vertical joints over studs, and fastened with $2\frac{1}{4}$ " Type S drywall screws, spaced 12" on center. Cavity to be filled with $3\frac{1}{2}$ " mineral wool insulation. | — | — | — | 4 $\frac{3}{4}$ |
| | 15-1.16 ^q | 2" × 6" wood studs at 24" centers with double top plates, single bottom plate; interior and exterior side covered with two layers of $\frac{5}{8}$ " Type X gypsum wallboard, 4' wide, applied horizontally with vertical joints over studs. Base layer fastened with $2\frac{1}{4}$ " Type S drywall screws, spaced 24" on center and face layer fastened with Type S drywall screws, spaced 8" on center, wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound. Cavity to be filled with $5\frac{1}{2}$ " mineral wool insulation. | — | — | 8 | — |
| | 15-2.1 ^d | $3\frac{5}{8}$ " No. 16 gage steel studs at 24" on center or 2" × 4" wood studs at 24" on center. Metal lath attached to the exterior side of studs with minimum 1" long No. 6 drywall screws at 6" on center and covered with minimum $\frac{3}{4}$ " thick Portland cement plaster. Thin veneer brick units of clay or shale complying with ASTM C1088, Grade TBS or better, installed in running bond in accordance with Section 1405.10. Combined total thickness of the Portland cement plaster, mortar and thin veneer brick units shall be not less than $1\frac{3}{4}$ ". Interior side covered with one layer of $\frac{5}{8}$ " thick Type X gypsum wallboard attached to studs with 1" long No. 6 drywall screws at 12" on center. | — | — | — | 6 |
| | 15-2.2 ^d | $3\frac{5}{8}$ " No. 16 gage steel studs at 24" on center or 2" × 4" wood studs at 24" on center. Metal lath attached to the exterior side of studs with minimum 1" long No. 6 drywall screws at 6" on center and covered with minimum $\frac{3}{4}$ " thick Portland cement plaster. Thin veneer brick units of clay or shale complying with ASTM C1088, Grade TBS or better, installed in running bond in accordance with Section 1405.10. Combined total thickness of the Portland cement plaster, mortar and thin veneer brick units shall be not less than 2". Interior side covered with two layers of $\frac{5}{8}$ " thick Type X gypsum wallboard. Bottom layer attached to studs with 1" long No. 6 drywall screws at 24" on center. Top layer attached to studs with $1\frac{5}{8}$ " long No. 6 drywall screws at 12" on center. | — | — | 6 $\frac{7}{8}$ | — |
| | 15-2.3 ^d | $3\frac{5}{8}$ " No. 16 gage steel studs at 16" on center or 2" × 4" wood studs at 16" on center. Where metal lath is used, attach to the exterior side of studs with minimum 1" long No. 6 drywall screws at 6" on center. Brick units of clay or shale not less than $2\frac{5}{8}$ " thick complying with ASTM C216 installed in accordance with Section 1405.6 with a minimum 1" airspace. Interior side covered with one layer of $\frac{5}{8}$ " thick Type X gypsum wallboard attached to studs with 1" long No. 6 drywall screws at 12" on center. | — | — | — | 7 $\frac{7}{8}$ |

(continued)

TABLE 721.1(2)—continued
RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS^{a, c, p}

| MATERIAL | ITEM NUMBER | CONSTRUCTION | MINIMUM FINISHED THICKNESS FACE-TO-FACE ^b (inches) | | | |
|---|---------------------|--|---|---------|-------------------------------|--------------------------------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour |
| 15. Exterior or interior walls | 15-2.4 ^d | 3 ⁵ / ₈ " No. 16 gage steel studs at 16" on center or 2" × 4" wood studs at 16" on center. Where metal lath is used, attach to the exterior side of studs with minimum 1" long No. 6 drywall screws at 6" on center. Brick units of clay or shale not less than 2 ⁵ / ₈ " thick complying with ASTM C216 installed in accordance with Section 1405.6 with a minimum 1" airspace. Interior side covered with two layers of 5 ⁵ / ₈ " thick Type X gypsum wallboard. Bottom layer attached to studs with 1" long No. 6 drywall screws at 24" on center. Top layer attached to studs with 1 ⁵ / ₈ " long No. 6 drywall screws at 12" on center. | — | — | 8 ¹ / ₂ | — |
| 16. Exterior walls rated for fire resistance from the inside only in accordance with Section 705.5. | 16-1.1 ^q | 2" × 4" wood studs at 16" centers with double top plates, single bottom plate; interior side covered with 5 ⁵ / ₈ " Type X gypsum wallboard, 4" wide, applied horizontally unblocked, and fastened with 2 ¹ / ₄ " Type S drywall screws, spaced 12" on center, wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound. Exterior covered with 3 ⁵ / ₈ " wood structural panels, applied vertically, horizontal joints blocked and fastened with 6d common nails (bright) — 12" on center in the field, and 6" on center panel edges. Cavity to be filled with 3 ¹ / ₂ " mineral wool insulation. Rating established for exposure from interior side only. | — | — | — | 4 ¹ / ₂ |
| | 16-1.2 ^q | 2" × 6" wood studs at 16" centers with double top plates, single bottom plate; interior side covered with 5 ⁵ / ₈ " Type X gypsum wallboard, 4" wide, applied horizontally or vertically with vertical joints over studs and fastened with 2 ¹ / ₄ " Type S drywall screws, spaced 12" on center, wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound, exterior side covered with 7 ⁷ / ₁₆ " wood structural panels fastened with 6d common nails (bright) spaced 12" on center in the field and 6" on center along the panel edges. Cavity to be filled with 5 ¹ / ₂ " mineral wool insulation. Rating established from the gypsum-covered side only. | — | — | — | 6 ⁹ / ₁₆ |
| | 16-1.3 ^q | 2" × 6" wood studs at 16" centers with double top plates, single bottom plates; interior side covered with 5 ⁵ / ₈ " Type X gypsum wallboard, 4" wide, applied vertically with all joints over framing or blocking and fastened with 2 ¹ / ₄ " Type S drywall screws spaced 7" on center. Joints to be covered with tape and joint compound. Exterior covered with 3 ⁵ / ₈ " wood structural panels, applied vertically with edges over framing or blocking and fastened with 6d common nails (bright) at 12" on center in the field and 6" on center on panel edges. R-19 mineral fiber insulation installed in stud cavity. Rating established from the gypsum-covered side only. | — | — | — | 6 ¹ / ₂ |

For SI: 1 inch = 25.4 mm, 1 square inch = 645.2 mm², 1 cubic foot = 0.0283 m³.

- Staples with equivalent holding power and penetration shall be permitted to be used as alternate fasteners to nails for attachment to wood framing.
- Thickness shown for brick and clay tile is nominal thicknesses unless plastered, in which case thicknesses are net. Thickness shown for concrete masonry and clay masonry is equivalent thickness defined in Section 722.3.1 for concrete masonry and Section 722.4.1.1 for clay masonry. Where all cells are solid grouted or filled with silicone-treated perlite loose-fill insulation; vermiculite loose-fill insulation; or expanded clay, shale or slate lightweight aggregate, the equivalent thickness shall be the thickness of the block or brick using specified dimensions as defined in Chapter 21. Equivalent thickness shall include the thickness of applied plaster and lath or gypsum wallboard, where specified.
- For units in which the net cross-sectional area of cored brick in any plane parallel to the surface containing the cores is not less than 75 percent of the gross cross-sectional area measured in the same plane.
- Shall be used for nonbearing purposes only.
- For all of the construction with gypsum wallboard described in this table, gypsum base for veneer plaster of the same size, thickness and core type shall be permitted to be substituted for gypsum wallboard, provided attachment is identical to that specified for the wallboard, and the joints on the face layer are reinforced and the entire surface is covered with not less than 1¹/₁₆-inch gypsum veneer plaster.
- The fire-resistance time period for concrete masonry units meeting the equivalent thicknesses required for a 2-hour *fire-resistance rating* in Item 3, and having a thickness of not less than 7⁵/₈ inches is 4 hours where cores that are not grouted are filled with silicone-treated perlite loose-fill insulation; vermiculite loose-fill insulation; or expanded clay, shale or slate lightweight aggregate, sand or slag having a maximum particle size of 3³/₈ inch.
- The *fire-resistance rating* of concrete masonry units composed of a combination of aggregate types or where plaster is applied directly to the concrete masonry shall be determined in accordance with ACI 216.1/TMS 0216. Lightweight aggregates shall have a maximum combined density of 65 pounds per cubic foot.

(continued)

FIRE AND SMOKE PROTECTION FEATURES

TABLE 721.1(2)—continued
RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS^{a, o}

- h. See Note b. The equivalent thickness shall be permitted to include the thickness of cement plaster or 1.5 times the thickness of gypsum plaster applied in accordance with the requirements of Chapter 25.
- i. Concrete walls shall be reinforced with horizontal and vertical temperature reinforcement as required by Chapter 19.
- j. Studs are welded truss wire studs with 0.18 inch (No. 7 B.W. gage) flange wire and 0.18 inch (No. 7 B.W. gage) truss wires.
- k. Nailable metal studs consist of two channel studs spot welded back to back with a crimped web forming a nailing groove.
- l. Wood structural panels shall be permitted to be installed between the fire protection and the wood studs on either the interior or exterior side of the wood frame assemblies in this table, provided the length of the fasteners used to attach the fire protection is increased by an amount not less than the thickness of the wood structural panel.
- m. For studs with a slenderness ratio, l/d , greater than 33, the design stress shall be reduced to 78 percent of allowable F'_c . For studs with a slenderness ratio, l/d , not exceeding 33, the design stress shall be reduced to 78 percent of the adjusted stress F'_c calculated for studs having a slenderness ratio l/d of 33.
- n. For properties of cooler or wallboard nails, see ASTM C514, ASTM C547 or ASTM F1667.
- o. Generic *fire-resistance ratings* (those not designated as PROPRIETARY* in the listing) in the GA 600 shall be accepted as if herein listed.
- p. NCMA TEK 5-8A shall be permitted for the design of fire walls.
- q. The design stress of studs shall be equal to a maximum of 100 percent of the allowable F'_c calculated in accordance with Section 2306.

TABLE 721.1(3)
MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS^{a, q}

| FLOOR OR ROOF CONSTRUCTION | ITEM NUMBER | CEILING CONSTRUCTION | THICKNESS OF FLOOR OR ROOF SLAB (inches) | | | | MINIMUM THICKNESS OF CEILING (inches) | | | |
|---------------------------------|-------------|---|--|---------|----------------|--------|---------------------------------------|---------------|---------------|--------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour | 4 hours | 3 hours | 2 hours | 1 hour |
| 1. Siliceous aggregate concrete | 1-1.1 | Slab (no ceiling required). Minimum cover over nonprestressed reinforcement shall be not less than $\frac{3}{4}$ " ^b . | 7.0 | 6.2 | 5.0 | 3.5 | — | — | — | — |
| 2. Carbonate aggregate concrete | 2-1.1 | | 6.6 | 5.7 | 4.6 | 3.2 | — | — | — | — |
| 3. Sand-light-weight concrete | 3-1.1 | | 5.4 | 4.6 | 3.8 | 2.7 | — | — | — | — |
| 4. Lightweight concrete | 4-1.1 | | 5.1 | 4.4 | 3.6 | 2.5 | — | — | — | — |
| 5. Reinforced concrete | 5-1.1 | Slab with suspended ceiling of vermiculite gypsum plaster over metal lath attached to $\frac{3}{4}$ " cold-rolled channels spaced 12" on center. Ceiling located 6" minimum below joists. | 3 | 2 | — | — | 1 | $\frac{3}{4}$ | — | — |
| | 5-2.1 | $\frac{3}{8}$ " Type X gypsum wallboard ^c attached to 0.018 inch (No. 25 carbon sheet steel gage) by $\frac{7}{8}$ " deep by $2\frac{5}{8}$ " hat-shaped galvanized steel channels with 1"-long No. 6 screws. The channels are spaced 24" on center, span 35" and are supported along their length at 35" intervals by 0.033" (No. 21 galvanized sheet gage) galvanized steel flat strap hangers having formed edges that engage the lips of the channel. The strap hangers are attached to the side of the concrete joists with $\frac{5}{32}$ " by $1\frac{1}{4}$ " long power-driven fasteners. The wallboard is installed with the long dimension perpendicular to the channels. End joints occur on channels and supplementary channels are installed parallel to the main channels, 12" each side, at end joint occurrences. The finished ceiling is located approximately 12" below the soffit of the floor slab. | — | — | $2\frac{1}{2}$ | — | — | — | $\frac{5}{8}$ | — |

(continued)

TABLE 721.1(3)—continued
MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS^{a, q}

| FLOOR OR ROOF CONSTRUCTION | ITEM NUMBER | CEILING CONSTRUCTION | THICKNESS OF FLOOR OR ROOF SLAB (inches) | | | | MINIMUM THICKNESS OF CEILING (inches) | | | |
|--|-------------|---|--|---------|-------------------------------|--|---------------------------------------|-------------------------------|-------------------------------|--|
| | | | 4 hours | 3 hours | 2 hours | 1 hour | 4 hours | 3 hours | 2 hours | 1 hour |
| 6. Steel joists constructed with a poured reinforced concrete slab on metal lath forms or steel form units ^{d, e} | 6-1.1 | Gypsum plaster on metal lath attached to the bottom cord with single No. 16 gage or doubled No. 18 gage wire ties spaced 6" on center. Plaster mixed 1:2 for scratch coat, 1:3 for brown coat, by weight, gypsum-to-sand aggregate for 2-hour system. For 3-hour system plaster is neat. | — | — | 2 ¹ / ₂ | 2 ¹ / ₄ | — | — | 3 ³ / ₄ | 5 ⁵ / ₈ |
| | 6-2.1 | Vermiculite gypsum plaster on metal lath attached to the bottom chord with single No.16 gage or doubled 0.049-inch (No. 18 B.W. gage) wire ties 6" on center. | — | 2 | — | — | — | 5 ⁵ / ₈ | — | — |
| | 6-3.1 | Cement plaster over metal lath attached to the bottom chord of joists with single No. 16 gage or doubled 0.049" (No. 18 B.W. gage) wire ties spaced 6" on center. Plaster mixed 1:2 for scratch coat, 1:3 for brown coat for 1-hour system and 1:1 for scratch coat, 1:1 1/2 for brown coat for 2-hour system, by weight, cement to sand. | — | — | — | 2 | — | — | — | 5 ⁵ / ₈ ^f |
| | 6-4.1 | Ceiling of 5 ⁵ / ₈ " Type X wallboard ^d attached to 7 ⁷ / ₈ " deep by 2 ⁵ / ₈ " by 0.021 inch (No. 25 carbon sheet steel gage) hat-shaped furring channels 12" on center with 1" long No. 6 wallboard screws at 8" on center. Channels wire tied to bottom chord of joists with doubled 0.049 inch (No. 18 B.W. gage) wire or suspended below joists on wire hangers. ^g | — | — | 2 ¹ / ₂ | — | — | — | 5 ⁵ / ₈ | — |
| | 6-5.1 | Wood-fibered gypsum plaster mixed 1:1 by weight gypsum to sand aggregate applied over metal lath. Lath tied 6" on center to 3 ³ / ₄ " channels spaced 13 ¹ / ₂ " on center. Channels secured to joists at each intersection with two strands of 0.049 inch (No. 18 B.W. gage) galvanized wire. | — | — | 2 ¹ / ₂ | — | — | — | 3 ³ / ₄ | — |
| 7. Reinforced concrete slabs and joists with hollow clay tile fillers laid end to end in rows 2 ¹ / ₂ " or more apart; reinforcement placed between rows and concrete cast around and over tile. | 7-1.1 | 5 ⁵ / ₈ " gypsum plaster on bottom of floor or roof construction. | — | — | 8 ^h | — | — | — | 5 ⁵ / ₈ | — |
| | 7-1.2 | None | — | — | — | 5 ¹ / ₂ ⁱ | — | — | — | — |
| 8. Steel joists constructed with a reinforced concrete slab on top poured on a 1 ¹ / ₂ " deep steel deck. ^e | 8-1.1 | Vermiculite gypsum plaster on metal lath attached to 3 ³ / ₄ " cold-rolled channels with 0.049" (No. 18 B.W. gage) wire ties spaced 6" on center. | 2 ¹ / ₂ ^j | — | — | — | 3 ³ / ₄ | — | — | — |

(continued)

TABLE 721.1(3)—continued
MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS^{a, q}

| FLOOR OR ROOF CONSTRUCTION | ITEM NUMBER | CEILING CONSTRUCTION | THICKNESS OF FLOOR OR ROOF SLAB (inches) | | | | MINIMUM THICKNESS OF CEILING (inches) | | | |
|---|-------------|---|--|---------|----------------|--------|---------------------------------------|---------|----------------------------|----------------------------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour | 4 hours | 3 hours | 2 hours | 1 hour |
| 9. 3" deep cellular steel deck with concrete slab on top. Slab thickness measured to top. | 9-1.1 | Suspended ceiling of vermiculite gypsum plaster base coat and vermiculite acoustical plaster on metal lath attached at 6" intervals to $\frac{3}{4}$ " cold-rolled channels spaced 12" on center and secured to $1\frac{1}{2}$ " cold-rolled channels spaced 36" on center with 0.065" (No. 16 B.W. gage) wire. $1\frac{1}{2}$ " channels supported by No. 8 gage wire hangers at 36" on center. Beams within envelope and with a $2\frac{1}{2}$ " airspace between beam soffit and lath have a 4-hour rating. | $2\frac{1}{2}$ | — | — | — | $1\frac{1}{8}$ ^k | — | — | — |
| 10. $1\frac{1}{2}$ "-deep steel roof deck on steel framing. Insulation board, 30 pcf density, composed of wood fibers with cement binders of thickness shown bonded to deck with unified asphalt adhesive. Covered with a Class A or B roof covering. | 10-1.1 | Ceiling of gypsum plaster on metal lath. Lath attached to $\frac{3}{4}$ " furring channels with 0.049" (No. 18 B.W. gage) wire ties spaced 6" on center. $\frac{3}{4}$ " channel saddle tied to 2" channels with doubled 0.065" (No. 16 B.W. gage) wire ties. 2" channels spaced 36" on center suspended 2" below steel framing and saddle-tied with 0.165" (No. 8 B.W. gage) wire. Plaster mixed 1:2 by weight, gypsum-to-sand aggregate. | — | — | $1\frac{7}{8}$ | 1 | — | — | $\frac{3}{4}$ ^l | $\frac{3}{4}$ ^l |
| 11. $1\frac{1}{2}$ "-deep steel roof deck on steel-framing wood fiber insulation board, 17.5 pcf density on top applied over a 15-lb asphalt-saturated felt. Class A or B roof covering. | 11-1.1 | Ceiling of gypsum plaster on metal lath. Lath attached to $\frac{3}{4}$ " furring channels with 0.049" (No. 18 B.W. gage) wire ties spaced 6" on center. $\frac{3}{4}$ " channels saddle tied to 2" channels with doubled 0.065" (No. 16 B.W. gage) wire ties. 2" channels spaced 36" on center suspended 2" below steel framing and saddle tied with 0.165" (No. 8 B.W. gage) wire. Plaster mixed 1:2 for scratch coat and 1:3 for brown coat, by weight, gypsum-to-sand aggregate for 1-hour system. For 2-hour system, plaster mix is 1:2 by weight, gypsum-to-sand aggregate. | — | — | $1\frac{1}{2}$ | 1 | — | — | $\frac{7}{8}$ ^g | $\frac{3}{4}$ ^l |

(continued)

TABLE 721.1(3) —continued
MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS^{a, q}

| FLOOR OR ROOF CONSTRUCTION | ITEM NUMBER | CEILING CONSTRUCTION | THICKNESS OF FLOOR OR ROOF SLAB (inches) | | | | MINIMUM THICKNESS OF CEILING (inches) | | | |
|---|-------------|--|--|---------|---------|--------|---------------------------------------|---------|---------|--------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour | 4 hours | 3 hours | 2 hours | 1 hour |
| 12. 1½" deep steel roof deck on steel-framing insulation of rigid board consisting of expanded perlite and fibers impregnated with integral asphalt waterproofing; density 9 to 12 pcf secured to metal roof deck by ½" wide ribbons of waterproof, cold-process liquid adhesive spaced 6" apart. Steel joist or light steel construction with metal roof deck, insulation, and Class A or B built-up roof covering. ^c | 12-1.1 | Gypsum-vermiculite plaster on metal lath wire tied at 6" intervals to ¾" furring channels spaced 12" on center and wire tied to 2" runner channels spaced 32" on center. Runners wire tied to bottom chord of steel joists. | — | — | 1 | — | — | — | 7/8 | — |
| 13. Double wood floor over wood joists spaced 16" on center. ^{m, n} | 13-1.1 | Gypsum plaster over 3/8" Type X gypsum lath. Lath initially applied with not less than four 1½" by No. 13 gage by 19/64" head plasterboard blued nails per bearing. Continuous stripping over lath along all joist lines. Stripping consists of 3" wide strips of metal lath attached by 1½" by No. 11 gage by ½" head roofing nails spaced 6" on center. Alternate stripping consists of 3" wide 0.049" diameter wire stripping weighing 1 pound per square yard and attached by No.16 gage by 1½" by ¾" crown width staples, spaced 4" on center. Where alternate stripping is used, the lath nailing shall consist of two nails at each end and one nail at each intermediate bearing. Plaster mixed 1:2 by weight, gypsum-to-sand aggregate. | — | — | — | — | — | — | — | 7/8 |
| | 13-1.2 | Cement or gypsum plaster on metal lath. Lath fastened with 1½" by No. 11 gage by 7/16" head barbed shank roofing nails spaced 5" on center. Plaster mixed 1:2 for scratch coat and 1:3 for brown coat, by weight, cement to sand aggregate. | — | — | — | — | — | — | — | 5/8 |
| | 13-1.3 | Perlite or vermiculite gypsum plaster on metal lath secured to joists with 1½" by No. 11 gage by 7/16" head barbed shank roofing nails spaced 5" on center. | — | — | — | — | — | — | — | 5/8 |
| | 13-1.4 | ½" Type X gypsum wallboard ^c nailed to joists with 5d cooler ^o or wallboard ^o nails at 6" on center. End joints of wallboard centered on joists. | — | — | — | — | — | — | — | 1/2 |

(continued)

TABLE 721.1(3) —continued
MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS^{a, q}

| FLOOR OR ROOF CONSTRUCTION | ITEM NUMBER | CEILING CONSTRUCTION | THICKNESS OF FLOOR OR ROOF SLAB (inches) | | | | MINIMUM THICKNESS OF CEILING (inches) | | | |
|---|-------------|---|--|---------|---------|------------------------------|---------------------------------------|---------|---------|--------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour | 4 hours | 3 hours | 2 hours | 1 hour |
| 14. Plywood stressed skin panels consisting of $\frac{5}{8}$ " - thick interior C-D (exterior glue) top stressed skin on 2" \times 6" nominal (minimum) stringers. Adjacent panel edges joined with 8d common wire nails spaced 6" on center. Stringers spaced 12" maximum on center. | 14-1.1 | $\frac{1}{2}$ " -thick wood fiberboard weighing 15 to 18 pounds per cubic foot installed with long dimension parallel to stringers or $\frac{3}{8}$ " C-D (exterior glue) plywood glued and/or nailed to stringers. Nailing to be with 5d cooler ^o or wallboard ^o nails at 12" on center. Second layer of $\frac{1}{2}$ " Type X gypsum wallboard ^c applied with long dimension perpendicular to joists and attached with 8d cooler ^o or wallboard ^o nails at 6" on center at end joints and 8" on center elsewhere. Wallboard joints staggered with respect to fiberboard joints. | — | — | — | — | — | — | — | 1 |
| 15. Vermiculite concrete slab proportioned 1:4 (Portland cement to vermiculite aggregate) on a 1 $\frac{1}{2}$ " -deep steel deck supported on individually protected steel framing. Maximum span of deck 6'-10" where deck is less than 0.019 inch (No. 26 carbon steel sheet gage) or greater. Slab reinforced with 4" \times 8" 0.109/0.083" (No. $\frac{12}{14}$ B.W. gage) welded wire mesh. | 15-1.1 | None | — | — | — | 3 ^j | — | — | — | — |
| 16. Perlite concrete slab proportioned 1:6 (Portland cement to perlite aggregate) on a 1 $\frac{1}{4}$ " -deep steel deck supported on individually protected steel framing. Slab reinforced with 4" \times 8" 0.109/0.083" (No. $\frac{12}{14}$ B.W. gage) welded wire mesh. | 16-1.1 | None | — | — | — | 3 $\frac{1}{2}$ ^j | — | — | — | — |

(continued)

TABLE 721.1(3)—continued
MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS^{a, q}

| FLOOR OR ROOF CONSTRUCTION | ITEM NUMBER | CEILING CONSTRUCTION | THICKNESS OF FLOOR OR ROOF SLAB (inches) | | | | MINIMUM THICKNESS OF CEILING (inches) | | | |
|--|-------------|---|--|--------------------------------|--------------------------------|--------|---------------------------------------|---------------|---------------|--------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour | 4 hours | 3 hours | 2 hours | 1 hour |
| 17. Perlite concrete slab proportioned 1:6 (Portland cement to perlite aggregate) on a $\frac{9}{16}$ "-deep steel deck supported by steel joists 4' on center. Class A or B roof covering on top. | 17-1.1 | Perlite gypsum plaster on metal lath wire tied to $\frac{3}{4}$ " furring channels attached with 0.065" (No. 16 B.W. gage) wire ties to lower chord of joists. | — | 2 ^p | 2 ^p | — | — | $\frac{7}{8}$ | $\frac{3}{4}$ | — |
| 18. Perlite concrete slab proportioned 1:6 (Portland cement to perlite aggregate) on 1 $\frac{1}{4}$ "-deep steel deck supported on individually protected steel framing. Maximum span of deck 6'-10" where deck is less than 0.019" (No. 26 carbon sheet steel gage) and 8'-0" where deck is 0.019" (No. 26 carbon sheet steel gage) or greater. Slab reinforced with 0.042" (No. 19 B.W. gage) hexagonal wire mesh. Class A or B roof covering on top. | 18-1.1 | None | — | 2 $\frac{1}{4}$ " ^p | 2 $\frac{1}{4}$ " ^p | — | — | — | — | — |
| 19. Floor and beam construction consisting of 3" -deep cellular steel floor unit mounted on steel members with 1:4 (proportion of Portland cement to perlite aggregate) perlite-concrete floor slab on top. | 19-1.1 | Suspended envelope ceiling of perlite gypsum plaster on metal lath attached to $\frac{3}{4}$ " cold-rolled channels, secured to 1 $\frac{1}{2}$ " cold-rolled channels spaced 42" on center supported by 0.203 inch (No. 6 B.W. gage) wire 36" on center. Beams in envelope with 3" minimum airspace between beam soffit and lath have a 4-hour rating. | 2 ^p | — | — | — | 1 ¹ | — | — | — |

(continued)

TABLE 721.1(3)—continued
MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS^{a, q}

| FLOOR OR ROOF CONSTRUCTION | ITEM NUMBER | CEILING CONSTRUCTION | THICKNESS OF FLOOR OR ROOF SLAB (inches) | | | | MINIMUM THICKNESS OF CEILING (inches) | | | |
|--|-------------|---|--|---------|---------|--------|---------------------------------------|---------|---------|----------------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour | 4 hours | 3 hours | 2 hours | 1 hour |
| 20. Perlite concrete proportioned 1:6 (Portland cement to perlite aggregate) poured to $\frac{1}{8}$ " thickness above top of corrugations of $1\frac{5}{16}$ " -deep galvanized steel deck maximum span 8'-0" for 0.024" (No. 24 galvanized sheet gage) or 6' 0" for 0.019" (No. 26 galvanized sheet gage) with deck supported by individually protected steel framing. Approved polystyrene foam plastic insulation board having a flame spread not exceeding 75 (1" to 4" thickness) with vent holes that approximate 3 percent of the board surface area placed on top of perlite slurry. A 2' by 4' insulation board contains six $2\frac{3}{4}$ " diameter holes. Board covered with $2\frac{1}{4}$ " minimum perlite concrete slab. Slab reinforced with mesh consisting of 0.042" (No. 19 B.W. gage) galvanized steel wire twisted together to form 2" hexagons with straight 0.065" (No. 16 B.W. gage) galvanized steel wire woven into mesh and spaced 3". Alternate slab reinforcement shall be permitted to consist of 4" x 8", 0.109/0.238" (No. 12/4 B.W. gage), or 2" x 2", 0.083/0.083" (No. 14/14 B.W. gage) welded wire fabric. Class A or B roof covering on top. | 20-1.1 | None | — | — | Varies | — | — | — | — | — |
| 21. Wood joists, wood I-joists, floor trusses and flat or pitched roof trusses spaced a maximum 24" o.c. with $\frac{1}{2}$ " wood structural panels with exterior glue applied at right angles to top of joist or top chord of trusses with 8d nails. The wood structural panel thickness shall be not less than nominal $\frac{1}{2}$ " nor less than required by Chapter 23. | 21-1.1 | Base layer $\frac{5}{8}$ " Type X gypsum wallboard applied at right angles to joist or truss 24" o.c. with $1\frac{1}{4}$ " Type S or Type W drywall screws 24" o.c. Face layer $\frac{5}{8}$ " Type X gypsum wallboard or veneer base applied at right angles to joist or truss through base layer with $1\frac{7}{8}$ " Type S or Type W drywall screws 12" o.c. at joints and intermediate joist or truss. Face layer Type G drywall screws placed 2" back on either side of face layer end joints, 12" o.c. | — | — | — | Varies | — | — | — | $1\frac{1}{4}$ |

(continued)

TABLE 721.1(3)—continued
MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS^{a, q}

| FLOOR OR ROOF CONSTRUCTION | ITEM NUMBER | CEILING CONSTRUCTION | THICKNESS OF FLOOR OR ROOF SLAB (inches) | | | | MINIMUM THICKNESS OF CEILING (inches) | | | |
|---|-------------|---|--|---------|---------|--------|---------------------------------------|---------|---------|--------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour | 4 hours | 3 hours | 2 hours | 1 hour |
| 22. Steel joists, floor trusses and flat or pitched roof trusses spaced a maximum 24" o.c. with 1/2" wood structural panels with exterior glue applied at right angles to top of joist or top chord of trusses with No. 8 screws. The wood structural panel thickness shall be not less than nominal 1/2" nor less than required by Chapter 23. | 22-1.1 | Base layer 5/8" Type X gypsum board applied at right angles to steel framing 24" on center with 1" Type S drywall screws spaced 24" on center. Face layer 5/8" Type X gypsum board applied at right angles to steel framing attached through base layer with 1 5/8" Type S drywall screws 12" on center at end joints and intermediate joints and 1 1/2" Type G drywall screws 12 inches on center placed 2" back on either side of face layer end joints. Joints of the face layer are offset 24" from the joints of the base layer. | — | — | — | Varies | — | — | — | 1 1/4 |
| 23. Wood I-joist (minimum joist depth 9 1/4" with a minimum flange depth of 1 5/16" and a minimum flange cross-sectional area of 2.25 square inches) at 24" o.c. spacing with a minimum 1 x 4 (3/4" x 3.5" actual) ledger strip applied parallel to and covering the bottom of the bottom flange of each member, tacked in place. 2" mineral wool insulation, 3.5 pcf (nominal) installed adjacent to the bottom flange of the I-joist and supported by the 1 x 4 ledger strip. | 23-1.1 | 1/2" deep single leg resilient channel 16" on center (channels doubled at wallboard end joints), placed perpendicular to the furring strip and joist and attached to each joist by 1 7/8" Type S drywall screws. 5/8" Type C gypsum wallboard applied perpendicular to the channel with end joints staggered not less than 4' and fastened with 1 1/8" Type S drywall screws spaced 7" on center. Wallboard joints to be taped and covered with joint compound. | — | — | — | Varies | — | — | — | 5/8 |
| 24. Wood I-joist (minimum I-joist depth 9 1/4" with a minimum flange depth of 1 1/2" and a minimum flange cross-sectional area of 5.25 square inches; minimum web thickness of 3/8") @ 24" o.c., 1 1/2" mineral wool insulation (2.5 pcf-nominal) resting on hat-shaped furring channels. | 24-1.1 | Minimum 0.026" thick hat-shaped channel 16" o.c. (channels doubled at wallboard end joints), placed perpendicular to the joist and attached to each joist by 1 1/4" Type S drywall screws. 5/8" Type C gypsum wallboard applied perpendicular to the channel with end joints staggered and fastened with 1 1/8" Type S drywall screws spaced 12" o.c. in the field and 8" o.c. at the wallboard ends. Wallboard joints to be taped and covered with joint compound. | — | — | — | Varies | — | — | — | 5/8 |
| 25. Wood I-joist (minimum I-joist depth 9 1/4" with a minimum flange depth of 1 1/2" and a minimum flange cross-sectional area of 5.25 square inches; minimum web thickness of 7/16") @ 24" o.c., 1 1/2" mineral wool insulation (2.5 pcf-nominal) resting on resilient channels. | 25-1.1 | Minimum 0.019" thick resilient channel 16" o.c. (channels doubled at wallboard end joints), placed perpendicular to the joist and attached to each joist by 1 5/8" Type S drywall screws. 5/8" Type C gypsum wallboard applied perpendicular to the channel with end joints staggered and fastened with 1" Type S drywall screws spaced 12" o.c. in the field and 8" o.c. at the wallboard ends. Wallboard joints to be taped and covered with joint compound. | — | — | — | Varies | — | — | — | 5/8 |

(continued)

TABLE 721.1(3)—continued
MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS^{a, q}

| FLOOR OR ROOF CONSTRUCTION | ITEM NUMBER | CEILING CONSTRUCTION | THICKNESS OF FLOOR OR ROOF SLAB (inches) | | | | MINIMUM THICKNESS OF CEILING (inches) | | | |
|--|-------------|--|--|---------|---------|--------|---------------------------------------|---------|---------|--------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour | 4 hours | 3 hours | 2 hours | 1 hour |
| 26. Wood I-joist (minimum I-joist depth 9 $\frac{1}{4}$ " with a minimum flange thickness of 1 $\frac{1}{2}$ " and a minimum flange cross-sectional area of 2.25 square inches; minimum web thickness of $\frac{3}{8}$ ") @ 24" o.c. | 26-1.1 | Two layers of $\frac{1}{2}$ " Type X gypsum wallboard applied with the long dimension perpendicular to the I-joists with end joints staggered. The base layer is fastened with 1 $\frac{5}{8}$ " Type S drywall screws spaced 12" o.c. and the face layer is fastened with 2" Type S drywall screws spaced 12" o.c. in the field and 8" o.c. on the edges. Face layer end joints shall not occur on the same I-joist as base layer end joints and edge joints shall be offset 24" from base layer joints. Face layer to also be attached to base layer with 1 $\frac{1}{2}$ " Type G drywall screws spaced 8" o.c. placed 6" from face layer end joints. Face layer wallboard joints to be taped and covered with joint compound. | — | — | — | Varies | — | — | — | 1 |
| 27. Wood I-joist (minimum I-joist depth 9 $\frac{1}{2}$ " with a minimum flange depth of 1 $\frac{5}{16}$ " and a minimum flange cross-sectional area of 1.95 square inches; minimum web thickness of $\frac{3}{8}$ ") @ 24" o.c. | 27-1.1 | Minimum 0.019" thick resilient channel 16" o.c. (channels doubled at wallboard end joints), placed perpendicular to the joist and attached to each joist by 1 $\frac{1}{4}$ " Type S drywall screws. Two layers of $\frac{1}{2}$ " Type X gypsum wallboard applied with the long dimension perpendicular to the I-joists with end joints staggered. The base layer is fastened with 1 $\frac{1}{4}$ " Type S drywall screws spaced 12" o.c. and the face layer is fastened with 1 $\frac{5}{8}$ " Type S drywall screws spaced 12" o.c. Face layer end joints shall not occur on the same I-joist as base layer end joints and edge joints shall be offset 24" from base layer joints. Face layer to also be attached to base layer with 1 $\frac{1}{2}$ " Type G drywall screws spaced 8" o.c. placed 6" from face layer end joints. Face layer wallboard joints to be taped and covered with joint compound. | — | — | — | Varies | — | — | — | 1 |

(continued)

TABLE 721.1(3)—continued
MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS^{a, q}

| FLOOR OR ROOF CONSTRUCTION | ITEM NUMBER | CEILING CONSTRUCTION | THICKNESS OF FLOOR OR ROOF SLAB (inches) | | | | MINIMUM THICKNESS OF CEILING (inches) | | | |
|---|-------------|--|--|---------|---------|--------|---------------------------------------|---------|-------------------------------|--------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour | 4 hours | 3 hours | 2 hours | 1 hour |
| 28. Wood I-joist (minimum I-joist depth 9 ¹ / ₄ " with a minimum flange depth of 1 ¹ / ₂ " and a minimum flange cross-sectional area of 2.25 square inches; minimum web thickness of 3 ³ / ₈ ") @ 24" o.c. Unfaced fiberglass insulation or mineral wool insulation is installed between the I-joists supported on the upper surface of the flange by stay wires spaced 12" o.c. | 28-1.1 | Base layer of 5 ⁵ / ₈ " Type C gypsum wall-board attached directly to I-joists with 1 ⁵ / ₈ " Type S drywall screws spaced 12" o.c. with ends staggered. Minimum 0.0179" thick hat-shaped 7 ⁷ / ₈ -inch furring channel 16" o.c. (channels doubled at wallboard end joints), placed perpendicular to the joist and attached to each joist by 1 ⁵ / ₈ " Type S drywall screws after the base layer of gypsum wall-board has been applied. The middle and face layers of 5 ⁵ / ₈ " Type C gypsum wall-board applied perpendicular to the channel with end joints staggered. The middle layer is fastened with 1" Type S drywall screws spaced 12" o.c. The face layer is applied parallel to the middle layer but with the edge joints offset 24" from those of the middle layer and fastened with 1 ⁵ / ₈ " Type S drywall screws 8" o.c. The joints shall be taped and covered with joint compound. | — | — | — | Varies | — | — | 2 ³ / ₄ | — |
| 29. Channel-shaped 18 gage steel joists (minimum depth 8") spaced a maximum 24" o.c. supporting tongue-and-groove wood structural panels (nominal minimum 3 ³ / ₄ " thick) applied perpendicular to framing members. Structural panels attached with 1 ⁵ / ₈ " Type S-12 screws spaced 12" o.c. | 29-1.1 | Base layer 5 ⁵ / ₈ " Type X gypsum board applied perpendicular to bottom of framing members with 1 ¹ / ₈ " Type S-12 screws spaced 12" o.c. Second layer 5 ⁵ / ₈ " Type X gypsum board attached perpendicular to framing members with 1 ⁵ / ₈ " Type S-12 screws spaced 12" o.c. Second layer joints offset 24" from base layer. Third layer 5 ⁵ / ₈ " Type X gypsum board attached perpendicular to framing members with 2 ³ / ₈ " Type S-12 screws spaced 12" o.c. Third layer joints offset 12" from second layer joints. Hat-shaped 7 ⁷ / ₈ -inch rigid furring channels applied at right angles to framing members over third layer with two 2 ³ / ₈ " Type S-12 screws at each framing member. Face layer 5 ⁵ / ₈ " Type X gypsum board applied at right angles to furring channels with 1 ¹ / ₈ " Type S screws spaced 12" o.c. | — | — | Varies | — | — | — | 3 ³ / ₈ | — |

(continued)

TABLE 721.1(3)—continued
MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS^{a, q}

| FLOOR OR ROOF CONSTRUCTION | ITEM NUMBER | CEILING CONSTRUCTION | THICKNESS OF FLOOR OR ROOF SLAB (inches) | | | | MINIMUM THICKNESS OF CEILING (inches) | | | |
|--|-------------|---|--|---------|---------|--------|---------------------------------------|---------|---------|--------|
| | | | 4 hours | 3 hours | 2 hours | 1 hour | 4 hours | 3 hours | 2 hours | 1 hour |
| 30. Wood I-joist (minimum I-joist depth 9½" with a minimum flange depth of 1½" and a minimum flange cross-sectional area of 2.25 square inches; minimum web thickness of 3⁄8") @ 24" o.c. Fiberglass insulation placed between I-joists supported by the resilient channels. | 30-1.1 | Minimum 0.019" thick resilient channel 16" o.c. (channels doubled at wallboard end joints), placed perpendicular to the joists and attached to each joist by 1¼" Type S drywall screws. Two layers of ½" Type X gypsum wallboard applied with the long dimension perpendicular to the I-joists with end joints staggered. The base layer is fastened with 1¼" Type S drywall screws spaced 12" o.c. and the face layer is fastened with 1⅝" Type S drywall screws spaced 12" o.c. Face layer end joints shall not occur on the same I-joist as base layer end joints and edge joints shall be offset 24" from base layer joints. Face layer to be attached to base layer with 1½" Type G drywall screws spaced 8" o.c. placed 6" from face layer end joints. Face layer wallboard joints to be taped and covered with joint compound. | — | — | — | Varies | — | — | — | 1 |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 0.454 kg, 1 cubic foot = 0.0283 m³,

1 pound per square inch = 6.895 kPa, 1 pound per linear foot = 1.4882 kg/m.

- a. Staples with equivalent holding power and penetration shall be permitted to be used as alternate fasteners to nails for attachment to wood framing.
- b. Where the slab is in an unrestrained condition, minimum reinforcement cover shall be not less than 1⅝ inches for 4 hours (siliceous aggregate only); 1¼ inches for 4 and 3 hours; 1 inch for 2 hours (siliceous aggregate only); and ¾ inch for all other restrained and unrestrained conditions.
- c. For all of the construction with gypsum wallboard described in this table, gypsum base for veneer plaster of the same size, thickness and core type shall be permitted to be substituted for gypsum wallboard, provided attachment is identical to that specified for the wallboard, and the joints on the face layer are reinforced and the entire surface is covered with not less than 1⁄16-inch gypsum veneer plaster.
- d. Slab thickness over steel joists measured at the joists for metal lath form and at the top of the form for steel form units.
- e. (a) The maximum allowable stress level for H-Series joists shall not exceed 22,000 psi.
 (b) The allowable stress for K-Series joists shall not exceed 26,000 psi, the nominal depth of such joist shall be not less than 10 inches and the nominal joist weight shall be not less than 5 pounds per linear foot.
- f. Cement plaster with 15 pounds of hydrated lime and 3 pounds of approved additives or admixtures per bag of cement.
- g. Gypsum wallboard ceilings attached to steel framing shall be permitted to be suspended with 1½-inch cold-formed carrying channels spaced 48 inches on center, that are suspended with No. 8 SWG galvanized wire hangers spaced 48 inches on center. Cross-furring channels are tied to the carrying channels with No. 18 SWG galvanized wire hangers spaced 48 inches on center. Cross-furring channels are tied to the carrying channels with No. 18 SWG galvanized wire (double strand) and spaced as required for direct attachment to the framing. This alternative is applicable to those steel framing assemblies recognized under Note q.
- h. Six-inch hollow clay tile with 2-inch concrete slab above.
- i. Four-inch hollow clay tile with 1½-inch concrete slab above.
- j. Thickness measured to bottom of steel form units.
- k. Five-eighths inch of vermiculite gypsum plaster plus ½ inch of approved vermiculite acoustical plastic.
- l. Furring channels spaced 12 inches on center.
- m. Double wood floor shall be permitted to be either of the following:
 - (a) Subfloor of 1-inch nominal boarding, a layer of asbestos paper weighing not less than 14 pounds per 100 square feet and a layer of 1-inch nominal tongue-and-groove finished flooring; or
 - (b) Subfloor of 1-inch nominal tongue-and-groove boarding or 15⁄32-inch wood structural panels with exterior glue and a layer of 1-inch nominal tongue-and-groove finished flooring or 19⁄32-inch wood structural panel finish flooring or a layer of Type I Grade M-1 particleboard not less than 5⁄8-inch thick.
- n. The ceiling shall be permitted to be omitted over unusable space, and flooring shall be permitted to be omitted where unusable space occurs above.
- o. For properties of cooler or wallboard nails, see ASTM C514, ASTM C547 or ASTM F1667.
- p. Thickness measured on top of steel deck unit.
- q. Generic *fire-resistance ratings* (those not designated as PROPRIETARY* in the listing) in the GA 600 shall be accepted as if herein listed.

SECTION 722

CALCULATED FIRE RESISTANCE

722.1 General. The provisions of this section contain procedures by which the *fire resistance* of specific materials or combinations of materials is established by calculations. These procedures apply only to the information contained in this section and shall not be otherwise used. The calculated *fire resistance* of concrete, concrete masonry and clay masonry assemblies shall be permitted in accordance with ACI 216.1/TMS 0216. The calculated *fire resistance* of steel assemblies shall be permitted in accordance with Chapter 5 of ASCE 29. The calculated *fire resistance* of exposed wood members and wood decking shall be permitted in accordance with Chapter 16 of ANSI/AWC *National Design Specification for Wood Construction (NDS)*.

722.1.1 Definitions. The following terms are defined in Chapter 2:

CERAMIC FIBER BLANKET.

CONCRETE, CARBONATE AGGREGATE.

CONCRETE, CELLULAR.

CONCRETE, LIGHTWEIGHT AGGREGATE.

CONCRETE, PERLITE.

CONCRETE, SAND-LIGHTWEIGHT.

CONCRETE, SILICEOUS AGGREGATE.

CONCRETE, VERMICULITE.

GLASS FIBERBOARD.

MINERAL BOARD.

722.2 Concrete assemblies. The provisions of this section contain procedures by which the *fire-resistance ratings* of concrete assemblies are established by calculations.

722.2.1 Concrete walls. Cast-in-place and precast concrete walls shall comply with Section 722.2.1.1. Multiwythe concrete walls shall comply with Section 722.2.1.2. Joints between precast panels shall comply with Section 722.2.1.3. Concrete walls with gypsum wallboard or plaster finish shall comply with Section 722.2.1.4.

722.2.1.1 Cast-in-place or precast walls. The minimum equivalent thicknesses of cast-in-place or precast concrete walls for *fire-resistance ratings* of 1 hour to 4 hours are shown in Table 722.2.1.1. For solid walls with flat vertical surfaces, the equivalent thickness is the same as the actual thickness. The values in Table 722.2.1.1 apply to plain, reinforced or prestressed concrete walls.

722.2.1.1.1 Hollow-core precast wall panels. For hollow-core precast concrete wall panels in which the cores are of constant cross section throughout

the length, calculation of the equivalent thickness by dividing the net cross-sectional area (the gross cross section minus the area of the cores) of the panel by its width shall be permitted.

TABLE 722.2.1.1
MINIMUM EQUIVALENT THICKNESS OF
CAST-IN-PLACE OR PRECAST CONCRETE WALLS,
LOAD-BEARING OR NONLOAD-BEARING

| CONCRETE TYPE | MINIMUM SLAB THICKNESS (inches) FOR FIRE-RESISTANCE RATING OF | | | | |
|------------------|--|----------|---------|---------|---------|
| | 1 hour | 1½ hours | 2 hours | 3 hours | 4 hours |
| Siliceous | 3.5 | 4.3 | 5.0 | 6.2 | 7.0 |
| Carbonate | 3.2 | 4.0 | 4.6 | 5.7 | 6.6 |
| Sand-lightweight | 2.7 | 3.3 | 3.8 | 4.6 | 5.4 |
| Lightweight | 2.5 | 3.1 | 3.6 | 4.4 | 5.1 |

For SI: 1 inch = 25.4 mm.

722.2.1.1.2 Core spaces filled. Where all of the core spaces of hollow-core wall panels are filled with loose-fill material, such as expanded shale, clay or slag, or vermiculite or perlite, the *fire-resistance rating* of the wall is the same as that of a solid wall of the same concrete type and of the same overall thickness.

722.2.1.1.3 Tapered cross sections. The thickness of panels with tapered cross sections shall be that determined at a distance $2t$ or 6 inches (152 mm), whichever is less, from the point of minimum thickness, where t is the minimum thickness.

722.2.1.1.4 Ribbed or undulating surfaces. The equivalent thickness of panels with ribbed or undulating surfaces shall be determined by one of the following expressions:

For $s \geq 4t$, the thickness to be used shall be t

For $s \leq 2t$, the thickness to be used shall be t_e

For $4t > s > 2t$, the thickness to be used shall be

$$t + \left(\frac{4t}{s} - 1 \right) (t_e - t) \quad \text{(Equation 7-3)}$$

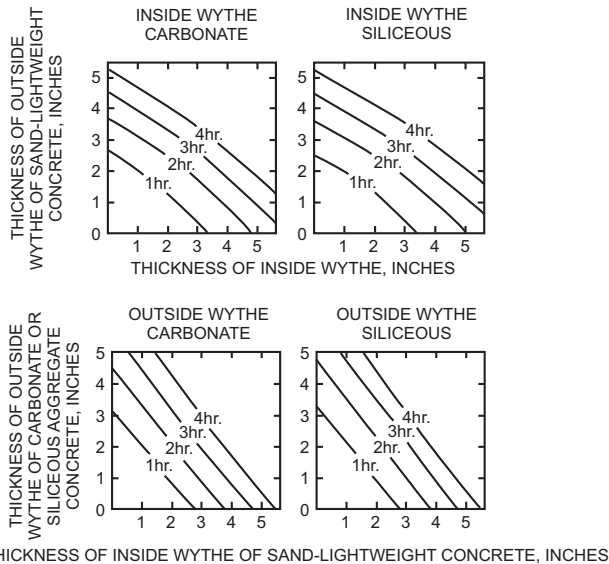
where:

s = Spacing of ribs or undulations.

t = Minimum thickness.

t_e = Equivalent thickness of the panel calculated as the net cross-sectional area of the panel divided by the width, in which the maximum thickness used in the calculation shall not exceed $2t$.

722.2.1.2 Multiwythe walls. For walls that consist of two wythes of different types of concrete, the *fire-resistance ratings* shall be permitted to be determined from Figure 722.2.1.2.



For SI: 1 inch = 25.4 mm.

FIGURE 722.2.1.2
FIRE-RESISTANCE RATINGS OF TWO-WYTHE CONCRETE WALLS

722.2.1.2.1 Two or more wythes. The *fire-resistance rating* for wall panels consisting of two or more wythes shall be permitted to be determined by the formula:

$$R = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59})^{1.7} \quad (\text{Equation 7-4})$$

where:

R = The fire endurance of the assembly, minutes.

R_1, R_2 , and R_n = The fire endurances of the individual wythes, minutes. Values of $R_n^{0.59}$ for use in Equation 7-4 are given in Table 722.2.1.2(1). Calculated *fire-resistance ratings* are shown in Table 722.2.1.2(2).

722.2.1.2.2 Foam plastic insulation. The *fire-resistance ratings* of precast concrete wall panels consisting of a layer of foam plastic insulation sandwiched between two wythes of concrete shall be permitted to be determined by use of Equation 7-4. Foam plastic insulation with a total thickness of less than 1 inch (25 mm) shall be disregarded. The R_n value for thickness of foam plastic insulation of 1 inch (25 mm) or greater, for use in the calculation, is 5 minutes; therefore $R_n^{0.59} = 2.5$.

722.2.1.3 Joints between precast wall panels. Joints between precast concrete wall panels that are not insulated as required by this section shall be considered as openings in walls. Uninsulated joints shall be included in determining the percentage of openings permitted by Table 705.8. Where openings are not permitted or are required by this code to be protected, the provisions of this section shall be used to determine the amount of joint insulation required. Insulated joints shall not be

TABLE 722.2.1.2(1)
VALUES OF $R_n^{0.59}$ FOR USE IN EQUATION 7-4

| TYPE OF MATERIAL | THICKNESS OF MATERIAL (inches) | | | | | | | | | | | |
|----------------------------------|--------------------------------|------|------|------|------|-------------------|--------|--------|-------------------|--------|--------|-------------------|
| | 1½ | 2 | 2½ | 3 | 3½ | 4 | 4½ | 5 | 5½ | 6 | 6½ | 7 |
| Siliceous aggregate concrete | 5.3 | 6.5 | 8.1 | 9.5 | 11.3 | 13.0 | 14.9 | 16.9 | 18.8 | 20.7 | 22.8 | 25.1 |
| Carbonate aggregate concrete | 5.5 | 7.1 | 8.9 | 10.4 | 12.0 | 14.0 | 16.2 | 18.1 | 20.3 | 21.9 | 24.7 | 27.2 ^c |
| Sand-lightweight concrete | 6.5 | 8.2 | 10.5 | 12.8 | 15.5 | 18.1 | 20.7 | 23.3 | 26.0 ^c | Note c | Note c | Note c |
| Lightweight concrete | 6.6 | 8.8 | 11.2 | 13.7 | 16.5 | 19.1 | 21.9 | 24.7 | 27.8 ^c | Note c | Note c | Note c |
| Insulating concrete ^a | 9.3 | 13.3 | 16.6 | 18.3 | 23.1 | 26.5 ^c | Note c | Note c | Note c | Note c | Note c | Note c |
| Airspace ^b | — | — | — | — | — | — | — | — | — | — | — | — |

For SI: 1 inch = 25.4 mm, 1 pound per cubic foot = 16.02 kg/m³.

a. Dry unit weight of 35 pcf or less and consisting of cellular, perlite or vermiculite concrete.

b. The $R_n^{0.59}$ value for one ½" to 3½" airspace is 3.3. The $R_n^{0.59}$ value for two ½" to 3½" airspaces is 6.7.

c. The *fire-resistance rating* for this thickness exceeds 4 hours.

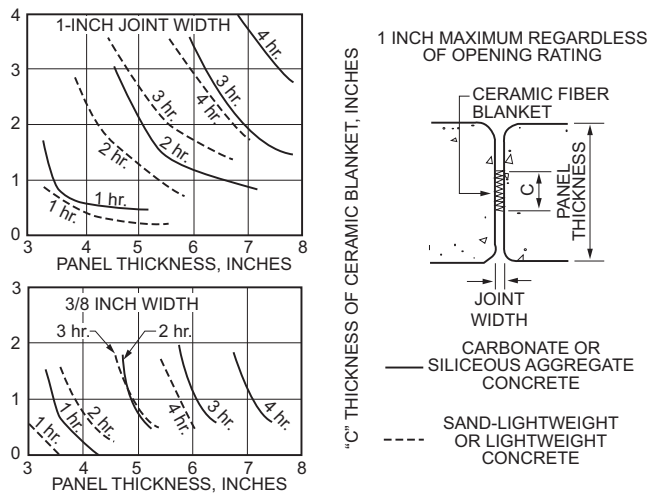
TABLE 722.2.1.2(2)
FIRE-RESISTANCE RATINGS BASED ON $R^{0.59}$

| R^a , MINUTES | $R^{0.59}$ |
|-----------------|------------|
| 60 | 11.20 |
| 120 | 16.85 |
| 180 | 21.41 |
| 240 | 25.37 |

a. Based on Equation 7-4.

considered openings for purposes of determining compliance with the allowable percentage of openings in Table 705.8.

722.2.1.3.1 Ceramic fiber joint protection. Figure 722.2.1.3.1 shows thicknesses of *ceramic fiber blankets* to be used to insulate joints between precast concrete wall panels for various panel thicknesses and for joint widths of $\frac{3}{8}$ inch (9.5 mm) and 1 inch (25 mm) for *fire-resistance ratings* of 1 hour to 4 hours. For joint widths between $\frac{3}{8}$ inch (9.5 mm) and 1 inch (25 mm), the thickness of *ceramic fiber blanket* is allowed to be determined by direct interpolation. Other tested and labeled materials are acceptable in place of *ceramic fiber blankets*.



For SI: 1 inch = 25.4 mm.

**FIGURE 722.2.1.3.1
CERAMIC FIBER JOINT PROTECTION**

722.2.1.4 Walls with gypsum wallboard or plaster finishes. The *fire-resistance rating* of cast-in-place or precast concrete walls with finishes of gypsum wallboard or plaster applied to one or both sides shall be permitted to be calculated in accordance with the provisions of this section.

722.2.1.4.1 Nonfire-exposed side. Where the finish of gypsum wallboard or plaster is applied to the side of the wall not exposed to fire, the contribution of the finish to the total *fire-resistance rating* shall be determined as follows: The thickness of the finish shall first be corrected by multiplying the actual thickness of the finish by the applicable factor determined from Table 722.2.1.4(1) based on the type of aggregate in the concrete. The corrected thickness of finish shall then be added to the actual or equivalent thickness of concrete and *fire-resistance rating* of the concrete and finish determined from Tables 722.2.1.1 and 722.2.1.2(1) and Figure 722.2.1.2.

722.2.1.4.2 Fire-exposed side. Where gypsum wallboard or plaster is applied to the fire-exposed side of the wall, the contribution of the finish to the total *fire-resistance rating* shall be determined as follows: The time assigned to the finish as established by Table 722.2.1.4(2) shall be added to the *fire-resistance rating* determined from Tables 722.2.1.1 and 722.2.1.2(1) and Figure 722.2.1.2 for the concrete alone, or to the rating determined in Section 722.2.1.4.1 for the concrete and finish on the non-fire-exposed side.

722.2.1.4.3 Nonsymmetrical assemblies. For a wall having no finish on one side or different types or thicknesses of finish on each side, the calculation procedures of Sections 722.2.1.4.1 and 722.2.1.4.2 shall be performed twice, assuming either side of the wall to be the fire-exposed side. The *fire-resistance rating* of the wall shall not exceed the lower of the two values.

Exception: For an exterior wall with a *fire separation distance* greater than 5 feet (1524 mm) the fire shall be assumed to occur on the interior side only.

722.2.1.4.4 Minimum concrete fire-resistance rating. Where finishes applied to one or both sides of a concrete wall contribute to the *fire-resistance rating*, the concrete alone shall provide not less than one-half of the total required *fire-resistance rating*.

**TABLE 722.2.1.4(1)
MULTIPLYING FACTOR FOR FINISHES ON NONFIRE-EXPOSED SIDE OF WALL**

| TYPE OF FINISH APPLIED TO CONCRETE OR CONCRETE MASONRY WALL | TYPE OF AGGREGATE USED IN CONCRETE OR CONCRETE MASONRY | | | |
|---|--|---|---|---|
| | Concrete: siliceous or carbonate Concrete Masonry: siliceous or carbonate; solid clay brick | Concrete: sand-lightweight Concrete Masonry: clay tile; hollow clay brick; concrete masonry units of expanded shale and < 20% sand | Concrete: lightweight Concrete Masonry: concrete masonry units of expanded shale, expanded clay, expanded slag, or pumice < 20% sand | Concrete Masonry: concrete masonry units of expanded slag, expanded clay, or pumice |
| Portland cement-sand plaster | 1.00 | 0.75 ^a | 0.75 ^a | 0.50 ^a |
| Gypsum-sand plaster | 1.25 | 1.00 | 1.00 | 1.00 |
| Gypsum-vermiculite or perlite plaster | 1.75 | 1.50 | 1.25 | 1.25 |
| Gypsum wallboard | 3.00 | 2.25 | 2.25 | 2.25 |

For SI: 1 inch = 25.4 mm.

a. For Portland cement-sand plaster $\frac{5}{8}$ inch or less in thickness and applied directly to the concrete or concrete masonry on the nonfire-exposed side of the wall, the multiplying factor shall be 1.00.

TABLE 722.2.1.4(2)
TIME ASSIGNED TO FINISH MATERIALS ON FIRE-EXPOSED SIDE OF WALL

| FINISH DESCRIPTION | TIME (minutes) |
|---|----------------|
| Gypsum wallboard | |
| $\frac{3}{8}$ inch | 10 |
| $\frac{1}{2}$ inch | 15 |
| $\frac{5}{8}$ inch | 20 |
| 2 layers of $\frac{3}{8}$ inch | 25 |
| 1 layer of $\frac{3}{8}$ inch, 1 layer of $\frac{1}{2}$ inch | 35 |
| 2 layers of $\frac{1}{2}$ inch | 40 |
| Type X gypsum wallboard | |
| $\frac{1}{2}$ inch | 25 |
| $\frac{5}{8}$ inch | 40 |
| Portland cement-sand plaster applied directly to concrete masonry | See Note a |
| Portland cement-sand plaster on metal lath | |
| $\frac{3}{4}$ inch | 20 |
| $\frac{7}{8}$ inch | 25 |
| 1 inch | 30 |
| Gypsum sand plaster on $\frac{3}{8}$ -inch gypsum lath | |
| $\frac{1}{2}$ inch | 35 |
| $\frac{5}{8}$ inch | 40 |
| $\frac{3}{4}$ inch | 50 |
| Gypsum sand plaster on metal lath | |
| $\frac{3}{4}$ inch | 50 |
| $\frac{7}{8}$ inch | 60 |
| 1 inch | 80 |

For SI: 1 inch = 25.4 mm.

- a. The actual thickness of Portland cement-sand plaster, provided it is $\frac{5}{8}$ inch or less in thickness, shall be permitted to be included in determining the equivalent thickness of the masonry for use in Table 722.3.2.

Additionally, the contribution to the *fire resistance* of the finish on the nonfire-exposed side of a *load-bearing wall* shall not exceed one-half the contribution of the concrete alone.

722.2.1.4.5 Concrete finishes. Finishes on concrete walls that are assumed to contribute to the total *fire-resistance rating* of the wall shall comply with the installation requirements of Section 722.3.2.5.

722.2.2 Concrete floor and roof slabs. Reinforced and prestressed floors and roofs shall comply with Section 722.2.2.1. Multicourse floors and roofs shall comply with Sections 722.2.2.2 and 722.2.2.3, respectively.

722.2.2.1 Reinforced and prestressed floors and roofs. The minimum thicknesses of reinforced and prestressed concrete floor or roof slabs for *fire-resistance ratings* of 1 hour to 4 hours are shown in Table 722.2.2.1.

Exception: Minimum thickness shall not be required for floors and ramps within open and enclosed parking garages constructed in accordance with Sections 406.5 and 406.6, respectively.

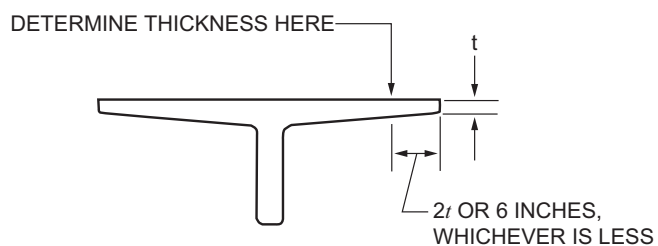
TABLE 722.2.2.1
MINIMUM SLAB THICKNESS (inches)

| CONCRETE TYPE | FIRE-RESISTANCE RATING (hours) | | | | |
|------------------|--------------------------------|-----|-----|-----|-----|
| | 1 | 1½ | 2 | 3 | 4 |
| Siliceous | 3.5 | 4.3 | 5 | 6.2 | 7 |
| Carbonate | 3.2 | 4 | 4.6 | 5.7 | 6.6 |
| Sand-lightweight | 2.7 | 3.3 | 3.8 | 4.6 | 5.4 |
| Lightweight | 2.5 | 3.1 | 3.6 | 4.4 | 5.1 |

For SI: 1 inch = 25.4 mm.

722.2.2.1.1 Hollow-core prestressed slabs. For hollow-core prestressed concrete slabs in which the cores are of constant cross section throughout the length, the equivalent thickness shall be permitted to be obtained by dividing the net cross-sectional area of the slab including grout in the joints, by its width.

722.2.2.1.2 Slabs with sloping soffits. The thickness of slabs with sloping soffits (see Figure 722.2.2.1.2) shall be determined at a distance $2t$ or 6 inches (152 mm), whichever is less, from the point of minimum thickness, where t is the minimum thickness.



For SI: 1 inch = 25.4 mm.

**FIGURE 722.2.2.1.2
DETERMINATION OF SLAB
THICKNESS FOR SLOPING SOFFITS**

722.2.2.1.3 Slabs with ribbed soffits. The thickness of slabs with ribbed or undulating soffits (see Figure 722.2.2.1.3) shall be determined by one of the following expressions, whichever is applicable:

For $s > 4t$, the thickness to be used shall be t

For $s \leq 2t$, the thickness to be used shall be t_e

For $4t > s > 2t$, the thickness to be used shall be

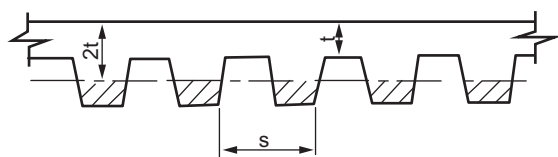
$$t + \left(\frac{4t}{s} - 1 \right) (t_e - t) \quad \text{(Equation 7-5)}$$

where:

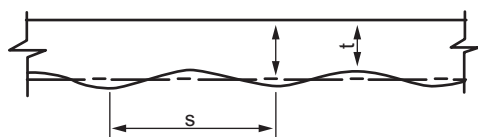
s = Spacing of ribs or undulations.

t = Minimum thickness.

t_e = Equivalent thickness of the slab calculated as the net area of the slab divided by the width, in which the maximum thickness used in the calculation shall not exceed $2t$.



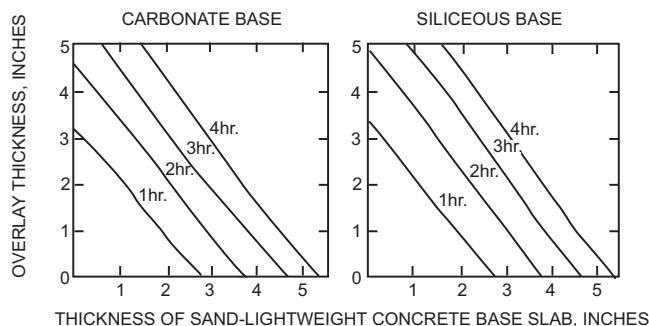
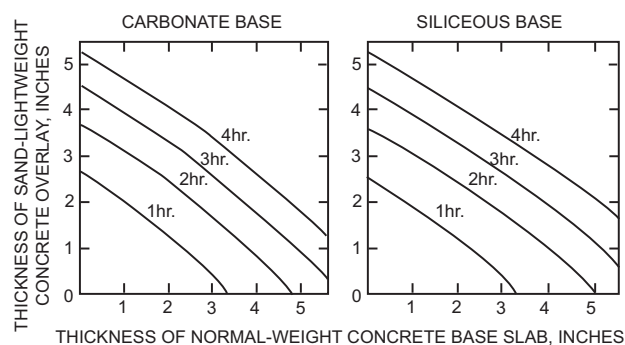
NEGLECT SHADED AREA IN CALCULATION OF EQUIVALENT THICKNESS



For SI: 1 inch = 25.4 mm.

**FIGURE 722.2.2.1.3
SLABS WITH RIBBED OR UNDULATING SOFFITS**

722.2.2.2 Multicourse floors. The *fire-resistance ratings* of floors that consist of a base slab of concrete with a topping (overlay) of a different type of concrete shall comply with Figure 722.2.2.2.



For SI: 1 inch = 25.4 mm.

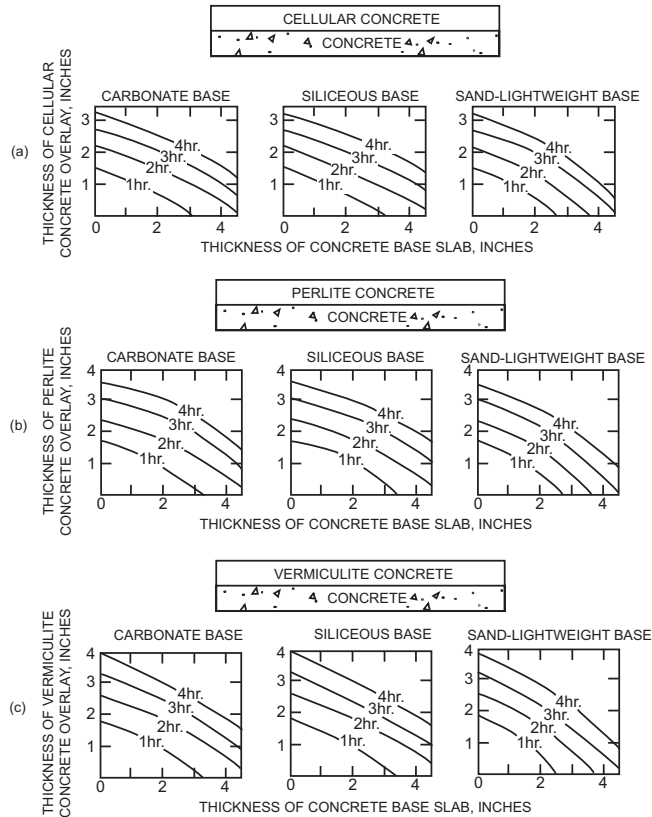
**FIGURE 722.2.2.2
FIRE-RESISTANCE RATINGS FOR
TWO-COURSE CONCRETE FLOORS**

722.2.2.3 Multicourse roofs. The *fire-resistance ratings* of roofs that consist of a base slab of concrete with a topping (overlay) of an insulating concrete or with an insulating board and built-up roofing shall comply with Figures 722.2.2.3(1) and 722.2.2.3(2).

722.2.2.3.1 Heat transfer. For the transfer of heat, three-ply built-up roofing contributes 10 minutes to the *fire-resistance rating*. The *fire-resistance rating* for concrete assemblies such as those shown in Figure 722.2.2.3(1) shall be increased by 10 minutes. This increase is not applicable to those shown in Figure 722.2.2.3(2).

722.2.2.4 Joints in precast slabs. Joints between adjacent precast concrete slabs need not be considered in calculating the slab thickness provided that a concrete topping not less than 1 inch (25 mm) thick is used. Where no concrete topping is used, joints must be grouted to a depth of not less than one-third the slab thickness at the joint, but not less than 1 inch (25 mm), or the joints must be made fire resistant by other *approved methods*.

722.2.3 Concrete cover over reinforcement. The minimum thickness of concrete cover over reinforcement in concrete slabs, reinforced beams and prestressed beams shall comply with this section.



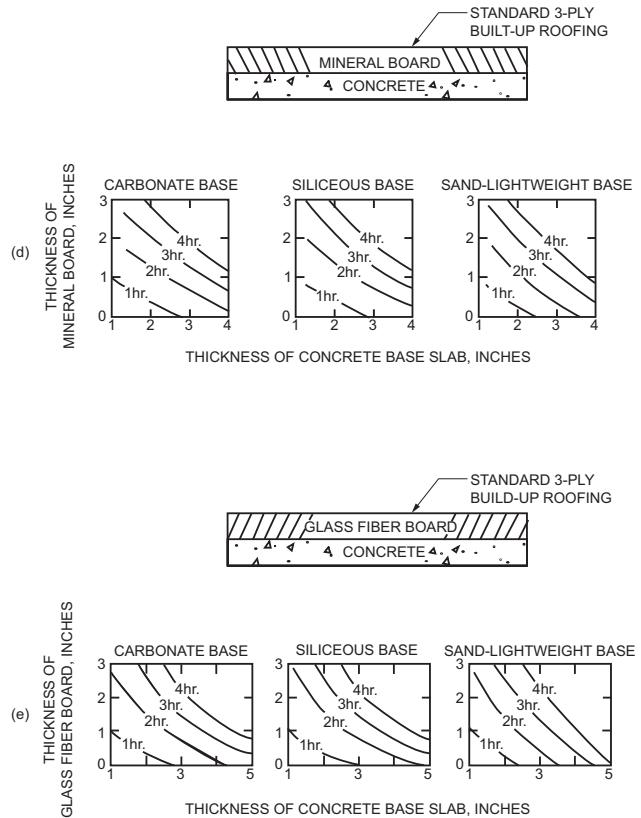
For SI: 1 inch = 25.4 mm.

FIGURE 722.2.3(1)
FIRE-RESISTANCE RATINGS FOR
CONCRETE ROOF ASSEMBLIES

722.2.3.1 Slab cover. The minimum thickness of concrete cover to the positive moment reinforcement shall comply with Table 722.2.3(1) for reinforced concrete and Table 722.2.3(2) for prestressed concrete. These tables are applicable for solid or hollow-core one-way or two-way slabs with flat undersurfaces. These tables are applicable to slabs that are either cast in place or precast. For precast prestressed concrete not covered elsewhere, the procedures contained in PCI MNL 124 shall be acceptable.

722.2.3.2 Reinforced beam cover. The minimum thickness of concrete cover to the positive moment reinforcement (bottom steel) for reinforced concrete beams is shown in Table 722.2.3(3) for *fire-resistance ratings* of 1 hour to 4 hours.

722.2.3.3 Prestressed beam cover. The minimum thickness of concrete cover to the positive moment prestressing tendons (bottom steel) for restrained and unrestrained prestressed concrete beams and stemmed units shall comply with the values shown in Tables 722.2.3(4) and 722.2.3(5) for *fire-resistance ratings* of 1 hour to 4 hours. Values in Table 722.2.3(4) apply to beams 8 inches (203 mm) or greater in width. Values in Table 722.2.3(5) apply to beams or stems of any width, provided the cross-section area is not less than 40 square inches (25 806 mm²). In case of differences



For SI: 1 inch = 25.4 mm.

FIGURE 722.2.3(2)
FIRE-RESISTANCE RATINGS
FOR CONCRETE ROOF ASSEMBLIES

between the values determined from Table 722.2.3(4) or 722.2.3(5), it is permitted to use the smaller value. The concrete cover shall be calculated in accordance with Section 722.2.3.3.1. The minimum concrete cover for nonprestressed reinforcement in prestressed concrete beams shall comply with Section 722.2.3.2.

722.2.3.3.1 Calculating concrete cover. The concrete cover for an individual tendon is the minimum thickness of concrete between the surface of the tendon and the fire-exposed surface of the beam, except that for ungrouted ducts, the assumed cover thickness is the minimum thickness of concrete between the surface of the duct and the fire-exposed surface of the beam. For beams in which two or more tendons are used, the cover is assumed to be the average of the minimum cover of the individual tendons. For corner tendons (tendons equal distance from the bottom and side), the minimum cover used in the calculation shall be one-half the actual value. For stemmed members with two or more prestressing tendons located along the vertical centerline of the stem, the average cover shall be the distance from the bottom of the member to the centroid of the tendons. The actual cover for any individual tendon shall be not less than one-half the smaller value shown in Tables 722.2.3(4) and 722.2.3(5), or 1 inch (25 mm), whichever is greater.

TABLE 722.2.3(1)
COVER THICKNESS FOR REINFORCED CONCRETE FLOOR OR ROOF SLABS (inches)

| CONCRETE AGGREGATE TYPE | FIRE-RESISTANCE RATING (hours) | | | | | | | | | |
|---------------------------------|--------------------------------|----|---|---|---|--------------|----|---|----|----|
| | Restrained | | | | | Unrestrained | | | | |
| | 1 | 1½ | 2 | 3 | 4 | 1 | 1½ | 2 | 3 | 4 |
| Siliceous | ¾ | ¾ | ¾ | ¾ | ¾ | ¾ | ¾ | 1 | 1¼ | 1⅝ |
| Carbonate | ¾ | ¾ | ¾ | ¾ | ¾ | ¾ | ¾ | ¾ | 1¼ | 1¼ |
| Sand-lightweight or lightweight | ¾ | ¾ | ¾ | ¾ | ¾ | ¾ | ¾ | ¾ | 1¼ | 1¼ |

For SI: 1 inch = 25.4 mm.

TABLE 722.2.3(2)
COVER THICKNESS FOR PRESTRESSED CONCRETE FLOOR OR ROOF SLABS (inches)

| CONCRETE AGGREGATE TYPE | FIRE-RESISTANCE RATING (hours) | | | | | | | | | |
|---------------------------------|--------------------------------|----|---|---|---|--------------|----|----|----|----|
| | Restrained | | | | | Unrestrained | | | | |
| | 1 | 1½ | 2 | 3 | 4 | 1 | 1½ | 2 | 3 | 4 |
| Siliceous | ¾ | ¾ | ¾ | ¾ | ¾ | 1⅛ | 1½ | 1¾ | 2⅜ | 2¾ |
| Carbonate | ¾ | ¾ | ¾ | ¾ | ¾ | 1 | 1⅜ | 1⅝ | 2⅛ | 2¼ |
| Sand-lightweight or lightweight | ¾ | ¾ | ¾ | ¾ | ¾ | 1 | 1⅜ | 1½ | 2 | 2¼ |

For SI: 1 inch = 25.4 mm.

TABLE 722.2.3(3)
MINIMUM COVER FOR MAIN REINFORCING BARS OF REINFORCED CONCRETE BEAMS^c
(APPLICABLE TO ALL TYPES OF STRUCTURAL CONCRETE)

| RESTRAINED OR UNRESTRAINED ^a | BEAM WIDTH ^b (inches) | FIRE-RESISTANCE RATING (hours) | | | | |
|---|----------------------------------|--------------------------------|----|----|----------------|-----------------|
| | | 1 | 1½ | 2 | 3 | 4 |
| Restrained | 5 | ¾ | ¾ | ¾ | 1 ^a | 1¼ ^a |
| | 7 | ¾ | ¾ | ¾ | ¾ | ¾ |
| | ≥ 10 | ¾ | ¾ | ¾ | ¾ | ¾ |
| Unrestrained | 5 | ¾ | 1 | 1¼ | — | — |
| | 7 | ¾ | ¾ | ¾ | 1¾ | 3 |
| | ≥ 10 | ¾ | ¾ | ¾ | 1 | 1¾ |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Tabulated values for restrained assemblies apply to beams spaced more than 4 feet on center. For restrained beams spaced 4 feet or less on center, minimum cover of ¾ inch is adequate for ratings of 4 hours or less.
- b. For beam widths between the tabulated values, the minimum cover thickness can be determined by direct interpolation.
- c. The cover for an individual reinforcing bar is the minimum thickness of concrete between the surface of the bar and the fire-exposed surface of the beam. For beams in which several bars are used, the cover for corner bars used in the calculation shall be reduced to one-half of the actual value. The cover for an individual bar must be not less than one-half of the value given in Table 722.2.3(3) nor less than ¾ inch.

TABLE 722.2.3(4)
MINIMUM COVER FOR PRESTRESSED CONCRETE BEAMS 8 INCHES OR GREATER IN WIDTH^b

| RESTRAINED OR UNRESTRAINED ^a | CONCRETE AGGREGATE TYPE | BEAM WIDTH (inches) | FIRE-RESISTANCE RATING (hours) | | | | |
|---|-------------------------|---------------------|--------------------------------|----|-----------------|-----------------|-----------------|
| | | | 1 | 1½ | 2 | 3 | 4 |
| Restrained | Carbonate or siliceous | 8 | 1½ | 1½ | 1½ | 1¾ ^a | 2½ ^a |
| | Carbonate or siliceous | ≥ 12 | 1½ | 1½ | 1½ | 1½ | 1¾ ^a |
| | Sand lightweight | 8 | 1½ | 1½ | 1½ | 1½ | 2 ^a |
| | Sand lightweight | ≥ 12 | 1½ | 1½ | 1½ | 1½ | 1⅝ ^a |
| Unrestrained | Carbonate or siliceous | 8 | 1½ | 1¾ | 2½ | 5 ^c | — |
| | Carbonate or siliceous | ≥ 12 | 1½ | 1½ | 1¾ ^a | 2½ | 3 |
| | Sand lightweight | 8 | 1½ | 1½ | 2 | 3¼ | — |
| | Sand lightweight | ≥ 12 | 1½ | 1½ | 1⅝ | 2 | 2½ |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Tabulated values for restrained assemblies apply to beams spaced more than 4 feet on center. For restrained beams spaced 4 feet or less on center, minimum cover of ¾ inch is adequate for 4-hour ratings or less.
- b. For beam widths between 8 inches and 12 inches, minimum cover thickness can be determined by direct interpolation.
- c. Not practical for 8-inch-wide beam but shown for purposes of interpolation.

TABLE 722.2.3(5)
MINIMUM COVER FOR PRESTRESSED CONCRETE BEAMS OF ALL WIDTHS

| RESTRAINED OR UNRESTRAINED ^a | CONCRETE AGGREGATE TYPE | BEAM AREA ^b A (square inches) | FIRE-RESISTANCE RATING (hours) | | | | |
|---|-------------------------|---|--------------------------------|----|----|----------------|----------------|
| | | | 1 | 1½ | 2 | 3 | 4 |
| Restrained | All | 40 ≤ A ≤ 150 | 1½ | 1½ | 2 | 2½ | — |
| | Carbonate or siliceous | 150 < A ≤ 300 | 1½ | 1½ | 1½ | 1¾ | 2½ |
| | | 300 < A | 1½ | 1½ | 1½ | 1½ | 2 |
| | Sand lightweight | 150 < A | 1½ | 1½ | 1½ | 1½ | 2 |
| Unrestrained | All | 40 ≤ A ≤ 150 | 2 | 2½ | — | — | — |
| | Carbonate or siliceous | 150 < A ≤ 300 | 1½ | 1¾ | 2½ | — | — |
| | | 300 < A | 1½ | 1½ | 2 | 3 ^c | 4 ^c |
| | Sand lightweight | 150 < A | 1½ | 1½ | 2 | 3 ^c | 4 ^c |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Tabulated values for restrained assemblies apply to beams spaced more than 4 feet on center. For restrained beams spaced 4 feet or less on center, minimum cover of ¾ inch is adequate for 4-hour ratings or less.
- b. The cross-sectional area of a stem is permitted to include a portion of the area in the flange, provided the width of the flange used in the calculation does not exceed three times the average width of the stem.
- c. U-shaped or hooped stirrups spaced not to exceed the depth of the member and having a minimum cover of 1 inch shall be provided.

722.2.4 Concrete columns. Concrete columns shall comply with this section.

722.2.4.1 Minimum size. The minimum overall dimensions of reinforced concrete columns for *fire-resistance ratings* of 1 hour to 4 hours for exposure to fire on all sides shall comply with this section.

722.2.4.1.1 Concrete strength less than or equal to 12,000 psi. For columns made with concrete having a specified compressive strength, f'_c , of less than or equal to 12,000 psi (82.7 MPa), the minimum dimension shall comply with Table 722.2.4.

TABLE 722.2.4
MINIMUM DIMENSION OF CONCRETE COLUMNS (inches)

| TYPES OF CONCRETE | FIRE-RESISTANCE RATING (hours) | | | | |
|-------------------|--------------------------------|----|----------------|----------------|----------------|
| | 1 | 1½ | 2 ^a | 3 ^a | 4 ^b |
| Siliceous | 8 | 9 | 10 | 12 | 14 |
| Carbonate | 8 | 9 | 10 | 11 | 12 |
| Sand-lightweight | 8 | 8½ | 9 | 10½ | 12 |

For SI: 1 inch = 25 mm.

- a. The minimum dimension is permitted to be reduced to 8 inches for rectangular columns with two parallel sides not less than 36 inches in length.
- b. The minimum dimension is permitted to be reduced to 10 inches for rectangular columns with two parallel sides not less than 36 inches in length.

722.2.4.1.2 Concrete strength greater than 12,000 psi. For columns made with concrete having a specified compressive strength, f'_c , greater than 12,000 psi (82.7 MPa), for *fire-resistance ratings* of 1 hour to 4 hours the minimum dimension shall be 24 inches (610 mm).

722.2.4.2 Minimum cover for R/C columns. The minimum thickness of concrete cover to the main longitudinal reinforcement in columns, regardless of the type of aggregate used in the concrete and the specified compressive strength of concrete, f'_c , shall be not less than 1 inch (25 mm) times the number of hours of required *fire resistance* or 2 inches (51 mm), whichever is less.

722.2.4.3 Tie and spiral reinforcement. For concrete columns made with concrete having a specified compressive strength, f'_c , greater than 12,000 psi (82.7 MPa), tie and spiral reinforcement shall comply with the following:

1. The free ends of rectangular ties shall terminate with a 135-degree (2.4 rad) standard tie hook.
2. The free ends of circular ties shall terminate with a 90-degree (1.6 rad) standard tie hook.
3. The free ends of spirals, including at lap splices, shall terminate with a 90-degree (1.6 rad) standard tie hook.

The hook extension at the free end of ties and spirals shall be the larger of six bar diameters and the extension required by Section 7.1.3 of ACI 318. Hooks shall project into the core of the column.

722.2.4.4 Columns built into walls. The minimum dimensions of Table 722.2.4 do not apply to a reinforced concrete column that is built into a concrete or masonry wall provided all of the following are met:

1. The *fire-resistance rating* for the wall is equal to or greater than the required rating of the column;
2. The main longitudinal reinforcing in the column has cover not less than that required by Section 722.2.4.2; and
3. Openings in the wall are protected in accordance with Table 716.5.

Where openings in the wall are not protected as required by Section 716.5, the minimum dimension of columns required to have a *fire-resistance rating* of 3 hours or less shall be 8 inches (203 mm), and 10 inches (254 mm) for columns required to have a *fire-resistance rating* of 4 hours, regardless of the type of aggregate used in the concrete.

722.2.4.5 Precast cover units for steel columns. See Section 722.5.1.4.

722.3 Concrete masonry. The provisions of this section contain procedures by which the *fire-resistance ratings* of concrete masonry are established by calculations.

722.3.1 Equivalent thickness. The equivalent thickness of concrete masonry construction shall be determined in accordance with the provisions of this section.

722.3.1.1 Concrete masonry unit plus finishes. The equivalent thickness of concrete masonry assemblies, T_{ea} , shall be computed as the sum of the equivalent thickness of the concrete masonry unit, T_e , as determined by Section 722.3.1.2, 722.3.1.3 or 722.3.1.4, plus the equivalent thickness of finishes, T_{ef} , determined in accordance with Section 722.3.2:

$$T_{ea} = T_e + T_{ef} \quad \text{(Equation 7-6)}$$

722.3.1.2 UngROUTED or partially grouted construction. T_e shall be the value obtained for the concrete masonry unit determined in accordance with ASTM C140.

722.3.1.3 Solid grouted construction. The equivalent thickness, T_e , of solid grouted concrete masonry units is the actual thickness of the unit.

722.3.1.4 Airspaces and cells filled with loose-fill material. The equivalent thickness of completely filled hollow concrete masonry is the actual thickness of the unit where loose-fill materials are: sand, pea gravel, crushed stone, or slag that meet ASTM C33 requirements; pumice, scoria, expanded shale, expanded clay, expanded slate, expanded slag, expanded fly ash, or cinders that comply with ASTM C331; or perlite or vermiculite meeting the requirements of ASTM C549 and ASTM C516, respectively.

722.3.2 Concrete masonry walls. The *fire-resistance rating* of walls and partitions constructed of concrete masonry units shall be determined from Table 722.3.2. The rating shall be based on the equivalent thickness of the masonry and type of aggregate used.

722.3.2.1 Finish on nonfire-exposed side. Where plaster or gypsum wallboard is applied to the side of the wall not exposed to fire, the contribution of the finish to the total *fire-resistance rating* shall be determined as follows: The thickness of gypsum wallboard or plaster shall be corrected by multiplying the actual thickness of the finish by applicable factor determined from Table 722.2.1.4(1). This corrected thickness of finish shall be added to the equivalent thickness of masonry and the *fire-resistance rating* of the masonry and finish determined from Table 722.3.2.

722.3.2.2 Finish on fire-exposed side. Where plaster or gypsum wallboard is applied to the fire-exposed side of the wall, the contribution of the finish to the total *fire-resistance rating* shall be determined as follows: The time assigned to the finish as established by Table 722.2.1.4(2) shall be added to the *fire-resistance rating* determined in Section 722.3.2 for the masonry alone, or in Section 722.3.2.1 for the masonry and finish on the nonfire-exposed side.

722.3.2.3 Nonsymmetrical assemblies. For a wall having no finish on one side or having different types or thicknesses of finish on each side, the calculation procedures of this section shall be performed twice,

TABLE 722.3.2
MINIMUM EQUIVALENT THICKNESS (inches) OF BEARING OR NONBEARING CONCRETE MASONRY WALLS^{a,b,c,d}

| TYPE OF AGGREGATE | FIRE-RESISTANCE RATING (hours) | | | | | | | | | | | | | | | |
|---------------------------------------|--------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | ½ | ¾ | 1 | 1¼ | 1½ | 1¾ | 2 | 2¼ | 2½ | 2¾ | 3 | 3¼ | 3½ | 3¾ | 4 | |
| Pumice or expanded slag | 1.5 | 1.9 | 2.1 | 2.5 | 2.7 | 3.0 | 3.2 | 3.4 | 3.6 | 3.8 | 4.0 | 4.2 | 4.4 | 4.5 | 4.7 | |
| Expanded shale, clay or slate | 1.8 | 2.2 | 2.6 | 2.9 | 3.3 | 3.4 | 3.6 | 3.8 | 4.0 | 4.2 | 4.4 | 4.6 | 4.8 | 4.9 | 5.1 | |
| Limestone, cinders or unexpanded slag | 1.9 | 2.3 | 2.7 | 3.1 | 3.4 | 3.7 | 4.0 | 4.3 | 4.5 | 4.8 | 5.0 | 5.2 | 5.5 | 5.7 | 5.9 | |
| Calcareous or siliceous gravel | 2.0 | 2.4 | 2.8 | 3.2 | 3.6 | 3.9 | 4.2 | 4.5 | 4.8 | 5.0 | 5.3 | 5.5 | 5.8 | 6.0 | 6.2 | |

For SI: 1 inch = 25.4 mm.

- a. Values between those shown in the table can be determined by direct interpolation.
 b. Where combustible members are framed into the wall, the thickness of solid material between the end of each member and the opposite face of the wall, or between members set in from opposite sides, shall be not less than 93 percent of the thickness shown in the table.
 c. Requirements of ASTM C55, ASTM C73, ASTM C90 or ASTM C744 shall apply.
 d. Minimum required equivalent thickness corresponding to the hourly *fire-resistance rating* for units with a combination of aggregate shall be determined by linear interpolation based on the percent by volume of each aggregate used in manufacture.

assuming either side of the wall to be the fire-exposed side. The *fire-resistance rating* of the wall shall not exceed the lower of the two values calculated.

Exception: For *exterior walls* with a *fire separation distance* greater than 5 feet (1524 mm), the fire shall be assumed to occur on the interior side only.

722.3.2.4 Minimum concrete masonry fire-resistance rating. Where the finish applied to a concrete masonry wall contributes to its *fire-resistance rating*, the masonry alone shall provide not less than one-half the total required *fire-resistance rating*.

722.3.2.5 Attachment of finishes. Installation of finishes shall be as follows:

1. Gypsum wallboard and gypsum lath applied to concrete masonry or concrete walls shall be secured to wood or steel furring members spaced not more than 16 inches (406 mm) on center (o.c.).
2. Gypsum wallboard shall be installed with the long dimension parallel to the furring members and shall have all joints finished.
3. Other aspects of the installation of finishes shall comply with the applicable provisions of Chapters 7 and 25.

722.3.3 Multiwythe masonry walls. The *fire-resistance rating* of wall assemblies constructed of multiple wythes of masonry materials shall be permitted to be based on the *fire-resistance rating* period of each wythe and the continuous airspace between each wythe in accordance with the following formula:

$$R_A = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59} + A_1 + A_2 + \dots + A_n)^{1.7}$$

(Equation 7-7)

where:

R_A = *Fire-resistance rating* of the assembly (hours).

R_1, R_2, \dots, R_n = *Fire-resistance rating* of wythes for 1, 2, n (hours), respectively.

A_1, A_2, \dots, A_n = 0.30, factor for each continuous airspace for 1, 2, n , respectively, having a depth

of 1/2 inch (12.7 mm) or more between wythes.

722.3.4 Concrete masonry lintels. *Fire-resistance ratings* for concrete masonry lintels shall be determined based upon the nominal thickness of the lintel and the minimum thickness of concrete masonry or concrete, or any combination thereof, covering the main reinforcing bars, as determined in accordance with Table 722.3.4, or by *approved* alternate methods.

TABLE 722.3.4
MINIMUM COVER OF LONGITUDINAL REINFORCEMENT IN FIRE-RESISTANCE-RATED REINFORCED CONCRETE MASONRY LINTELS (inches)

| NOMINAL WIDTH OF LINTEL (inches) | FIRE-RESISTANCE RATING (hours) | | | |
|----------------------------------|--------------------------------|-------|-------|-------|
| | 1 | 2 | 3 | 4 |
| 6 | 1 1/2 | 2 | — | — |
| 8 | 1 1/2 | 1 1/2 | 1 3/4 | 3 |
| 10 or greater | 1 1/2 | 1 1/2 | 1 1/2 | 1 3/4 |

For SI: 1 inch = 25.4 mm.

722.3.5 Concrete masonry columns. The *fire-resistance rating* of concrete masonry columns shall be determined based upon the least plan dimension of the column in accordance with Table 722.3.5 or by *approved* alternate methods.

TABLE 722.3.5
MINIMUM DIMENSION OF CONCRETE MASONRY COLUMNS (inches)

| FIRE-RESISTANCE RATING (hours) | | | |
|--------------------------------|-----------|-----------|-----------|
| 1 | 2 | 3 | 4 |
| 8 inches | 10 inches | 12 inches | 14 inches |

For SI: 1 inch = 25.4 mm.

722.4 Clay brick and tile masonry. The provisions of this section contain procedures by which the *fire-resistance ratings* of clay brick and tile masonry are established by calculations.

722.4.1 Masonry walls. The *fire-resistance rating* of masonry walls shall be based upon the equivalent thickness as calculated in accordance with this section. The calculation shall take into account finishes applied to the wall and airspaces between wythes in multiwythe construction.

722.4.1.1 Equivalent thickness. The *fire-resistance ratings* of walls or partitions constructed of solid or hollow clay masonry units shall be determined from Table 722.4.1(1) or 722.4.1(2). The equivalent thickness of the clay masonry unit shall be determined by Equation 7-8 where using Table 722.4.1(1). The *fire-resistance rating* determined from Table 722.4.1(1) shall be permitted to be used in the calculated *fire-resistance rating* procedure in Section 722.4.2.

$$T_e = V_n/LH \quad (\text{Equation 7-8})$$

where:

T_e = The equivalent thickness of the clay masonry unit (inches).

V_n = The net volume of the clay masonry unit (inch³).

L = The specified length of the clay masonry unit (inches).

H = The specified height of the clay masonry unit (inches).

722.4.1.1.1 Hollow clay units. The equivalent thickness, T_e , shall be the value obtained for hollow clay units as determined in accordance with Equation 7-8. The net volume, V_n , of the units shall be determined using the gross volume and percentage of void area determined in accordance with ASTM C67.

722.4.1.1.2 Solid grouted clay units. The equivalent thickness of solid grouted clay masonry units shall be taken as the actual thickness of the units.

722.4.1.1.3 Units with filled cores. The equivalent thickness of the hollow clay masonry units is the actual thickness of the unit where completely filled with loose-fill materials of: sand, pea gravel, crushed stone, or slag that meet ASTM C33 requirements; pumice, scoria, expanded shale, expanded

TABLE 722.4.1(1)
FIRE-RESISTANCE PERIODS OF CLAY MASONRY WALLS

| MATERIAL TYPE | MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE RESISTANCE ^{a, b, c} (inches) | | | |
|--|--|---------|---------|---------|
| | 1 hour | 2 hours | 3 hours | 4 hours |
| Solid brick of clay or shale ^d | 2.7 | 3.8 | 4.9 | 6.0 |
| Hollow brick or tile of clay or shale, unfilled | 2.3 | 3.4 | 4.3 | 5.0 |
| Hollow brick or tile of clay or shale, grouted or filled with materials specified in Section 722.4.1.1.3 | 3.0 | 4.4 | 5.5 | 6.6 |

For SI: 1 inch = 25.4 mm.

a. Equivalent thickness as determined from Section 722.4.1.1.

b. Calculated fire resistance between the hourly increments listed shall be determined by linear interpolation.

c. Where combustible members are framed in the wall, the thickness of solid material between the end of each member and the opposite face of the wall, or between members set in from opposite sides, shall be not less than 93 percent of the thickness shown.

d. For units in which the net cross-sectional area of cored brick in any plane parallel to the surface containing the cores is not less than 75 percent of the gross cross-sectional area measured in the same plane.

TABLE 722.4.1(2)
FIRE-RESISTANCE RATINGS FOR BEARING STEEL FRAME BRICK VENEER WALLS OR PARTITIONS

| WALL OR PARTITION ASSEMBLY | PLASTER SIDE EXPOSED (hours) | BRICK FACED SIDE EXPOSED (hours) |
|---|------------------------------|----------------------------------|
| Outside facing of steel studs: $\frac{1}{2}$ " wood fiberboard sheathing next to studs, $\frac{3}{4}$ " airspace formed with $\frac{3}{4}$ " \times $1\frac{5}{8}$ " wood strips placed over the fiberboard and secured to the studs; metal or wire lath nailed to such strips, $\frac{3}{4}$ " brick veneer held in place by filling $\frac{3}{4}$ " airspace between the brick and lath with mortar. Inside facing of studs: $\frac{3}{4}$ " unsanded gypsum plaster on metal or wire lath attached to $\frac{5}{16}$ " wood strips secured to edges of the studs. | 1.5 | 4 |
| Outside facing of steel studs: 1" insulation board sheathing attached to studs, 1" airspace, and $\frac{3}{4}$ " brick veneer attached to steel frame with metal ties every 5th course. Inside facing of studs: $\frac{7}{8}$ " sanded gypsum plaster (1:2 mix) applied on metal or wire lath attached directly to the studs. | 1.5 | 4 |
| Same as above except use $\frac{7}{8}$ " vermiculite-gypsum plaster or 1" sanded gypsum plaster (1:2 mix) applied to metal or wire. | 2 | 4 |
| Outside facing of steel studs: $\frac{1}{2}$ " gypsum sheathing board, attached to studs, and $\frac{3}{4}$ " brick veneer attached to steel frame with metal ties every 5th course. Inside facing of studs: $\frac{1}{2}$ " sanded gypsum plaster (1:2 mix) applied to $\frac{1}{2}$ " perforated gypsum lath securely attached to studs and having strips of metal lath 3 inches wide applied to all horizontal joints of gypsum lath. | 2 | 4 |

For SI: 1 inch = 25.4 mm.

clay, expanded slate, expanded slag, expanded fly ash, or cinders in compliance with ASTM C331; or perlite or vermiculite meeting the requirements of ASTM C549 and ASTM C516, respectively.

722.4.1.2 Plaster finishes. Where plaster is applied to the wall, the total *fire-resistance rating* shall be determined by the formula:

$$R = (R_n^{0.59} + pl)^{1.7} \quad \text{(Equation 7-9)}$$

where:

R = The *fire-resistance rating* of the assembly (hours).

R_n = The *fire-resistance rating* of the individual wall (hours).

pl = Coefficient for thickness of plaster.

Values for $R_n^{0.59}$ for use in Equation 7-9 are given in Table 722.4.1(3). Coefficients for thickness of plaster shall be selected from Table 722.4.1(4) based on the actual thickness of plaster applied to the wall or partition and whether one or two sides of the wall are plastered.

TABLE 722.4.1(3)
VALUES OF $R_n^{0.59}$

| $R_n^{0.59}$ | R (hours) |
|--------------|-------------|
| 1 | 1.0 |
| 2 | 1.50 |
| 3 | 1.91 |
| 4 | 2.27 |

TABLE 722.4.1(4)
COEFFICIENTS FOR PLASTER, pl^a

| THICKNESS OF PLASTER (inch) | ONE SIDE | TWO SIDES |
|-----------------------------|----------|-----------|
| $\frac{1}{2}$ | 0.3 | 0.6 |
| $\frac{5}{8}$ | 0.37 | 0.75 |
| $\frac{3}{4}$ | 0.45 | 0.90 |

For SI: 1 inch = 25.4 mm.

a. Values listed in the table are for 1:3 sanded gypsum plaster.

TABLE 722.4.1(5)
REINFORCED MASONRY LINTELS

| NOMINAL LINTEL WIDTH (inches) | MINIMUM LONGITUDINAL REINFORCEMENT COVER FOR FIRE RESISTANCE (inches) | | | |
|-------------------------------|---|----------------|----------------|----------------|
| | 1 hour | 2 hours | 3 hours | 4 hours |
| 6 | $1\frac{1}{2}$ | 2 | NP | NP |
| 8 | $1\frac{1}{2}$ | $1\frac{1}{2}$ | $1\frac{3}{4}$ | 3 |
| 10 or more | $1\frac{1}{2}$ | $1\frac{1}{2}$ | $1\frac{1}{2}$ | $1\frac{3}{4}$ |

For SI: 1 inch = 25.4 mm.

NP = Not permitted.

TABLE 722.4.1(6)
REINFORCED CLAY MASONRY COLUMNS

| COLUMN SIZE | FIRE-RESISTANCE RATING (hours) | | | |
|-----------------------------------|--------------------------------|----|----|----|
| | 1 | 2 | 3 | 4 |
| Minimum column dimension (inches) | 8 | 10 | 12 | 14 |

For SI: 1 inch = 25.4 mm.

722.4.1.3 Multiwythe walls with airspace. Where a continuous airspace separates multiple wythes of the wall or partition, the total *fire-resistance rating* shall be determined by the formula:

$$R = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59} + as)^{1.7} \quad \text{(Equation 7-10)}$$

where:

R = The *fire-resistance rating* of the assembly (hours).

R_1, R_2 and R_n = The *fire-resistance rating* of the individual wythes (hours).

as = Coefficient for continuous airspace.

Values for $R_n^{0.59}$ for use in Equation 7-10 are given in Table 722.4.1(3). The coefficient for each continuous airspace of $\frac{1}{2}$ inch to $3\frac{1}{2}$ inches (12.7 to 89 mm) separating two individual wythes shall be 0.3.

722.4.1.4 Nonsymmetrical assemblies. For a wall having no finish on one side or having different types or thicknesses of finish on each side, the calculation procedures of this section shall be performed twice, assuming either side to be the fire-exposed side of the wall. The *fire resistance* of the wall shall not exceed the lower of the two values determined.

Exception: For *exterior walls* with a *fire separation distance* greater than 5 feet (1524 mm), the fire shall be assumed to occur on the interior side only.

722.4.2 Multiwythe walls. The *fire-resistance rating* for walls or partitions consisting of two or more dissimilar wythes shall be permitted to be determined by the formula:

$$R = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59})^{1.7} \quad \text{(Equation 7-11)}$$

where:

R = The *fire-resistance rating* of the assembly (hours).

R_1, R_2 and R_n = The *fire-resistance rating* of the individual wythes (hours).

Values for $R_n^{0.59}$ for use in Equation 7-11 are given in Table 722.4.1(3).

722.4.2.1 Multiwythe walls of different material. For walls that consist of two or more wythes of different materials (concrete or concrete masonry units) in combination with clay masonry units, the *fire-resistance rating* of the different materials shall be permitted to be determined from Table 722.2.1.1 for concrete; Table 722.3.2 for concrete masonry units or Table 722.4.1(1) or 722.4.1(2) for clay and tile masonry units.

722.4.3 Reinforced clay masonry lintels. *Fire-resistance ratings* for clay masonry lintels shall be determined based on the nominal width of the lintel and the minimum covering for the longitudinal reinforcement in accordance with Table 722.4.1(5).

722.4.4 Reinforced clay masonry columns. The *fire-resistance ratings* shall be determined based on the last plan dimension of the column in accordance with Table 722.4.1(6). The minimum cover for longitudinal reinforcement shall be 2 inches (51 mm).

722.5 Steel assemblies. The provisions of this section contain procedures by which the *fire-resistance ratings* of steel assemblies are established by calculations.

722.5.1 Structural steel columns. The *fire-resistance ratings* of structural steel columns shall be based on the size of the element and the type of protection provided in accordance with this section.

722.5.1.1 General. These procedures establish a basis for determining the *fire resistance* of column assemblies as a function of the thickness of fire-resistant material and, the weight, W , and heated perimeter, D , of structural steel columns. As used in these sections, W is the average weight of a structural steel column in pounds per linear foot. The heated perimeter, D , is the inside perimeter of the fire-resistant material in inches as illustrated in Figure 722.5.1(1).

722.5.1.1.1 Nonload-bearing protection. The application of these procedures shall be limited to column assemblies in which the fire-resistant material is not designed to carry any of the load acting on the column.

722.5.1.1.2 Embedments. In the absence of substantiating fire-endurance test results, ducts, conduit, piping, and similar mechanical, electrical, and plumbing installations shall not be embedded in any required fire-resistant materials.

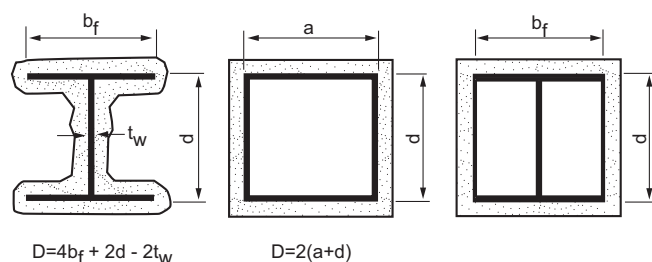


FIGURE 722.5.1(1)
DETERMINATION OF THE HEATED
PERIMETER OF STRUCTURAL STEEL COLUMNS

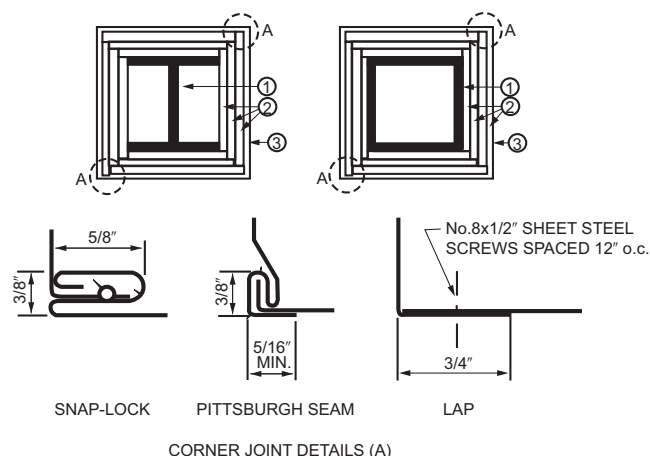


FIGURE 722.5.1(2)
GYPSUM-PROTECTED STRUCTURAL
STEEL COLUMNS WITH SHEET STEEL COLUMN COVERS

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm.

1. Structural steel column, either wide flange or tubular shapes.
2. Type X gypsum board or gypsum panel products in accordance with ASTM C1177, C1178, C1278, C1396 or C1658. The total thickness of gypsum board or gypsum panel products calculated as h in Section 722.5.1.2 shall be applied vertically to an individual column using one of the following methods:
 1. As a single layer with no horizontal joints.
 2. As multiple layers with no horizontal joints permitted in any layer.
 3. As multiple layers with horizontal joints staggered not less than 12 inches vertically between layers and not less than 8 feet vertically in any single layer. The total required thickness of gypsum board or gypsum panel products shall be determined on the basis of the specified *fire-resistance rating* and the weight-to-heated-perimeter ratio (W/D) of the column. For *fire-resistance ratings* of 2 hours or less, one of the required layers of gypsum board or gypsum panel product may be applied to the exterior of the sheet steel column covers with 1-inch long Type S screws spaced 1 inch from the wallboard edge and 8 inches on center. For such installations, 0.0149-inch minimum thickness galvanized steel corner beads with 1 1/2-inch legs shall be attached to the wallboard with Type S screws spaced 12 inches on center.
3. For *fire-resistance ratings* of 3 hours or less, the column covers shall be fabricated from 0.0239-inch minimum thickness galvanized or stainless steel. For 4-hour *fire-resistance ratings*, the column covers shall be fabricated from 0.0239-inch minimum thickness stainless steel. The column covers shall be erected with the Snap Lock or Pittsburgh joint details.

For *fire-resistance ratings* of 2 hours or less, column covers fabricated from 0.0269-inch minimum thickness galvanized or stainless steel shall be permitted to be erected with lap joints. The lap joints shall be permitted to be located anywhere around the perimeter of the column cover. The lap joints shall be secured with 1/2-inch-long No. 8 sheet metal screws spaced 12 inches on center.

The column covers shall be provided with a minimum expansion clearance of 1/8 inch per linear foot between the ends of the cover and any restraining construction.

FIRE AND SMOKE PROTECTION FEATURES

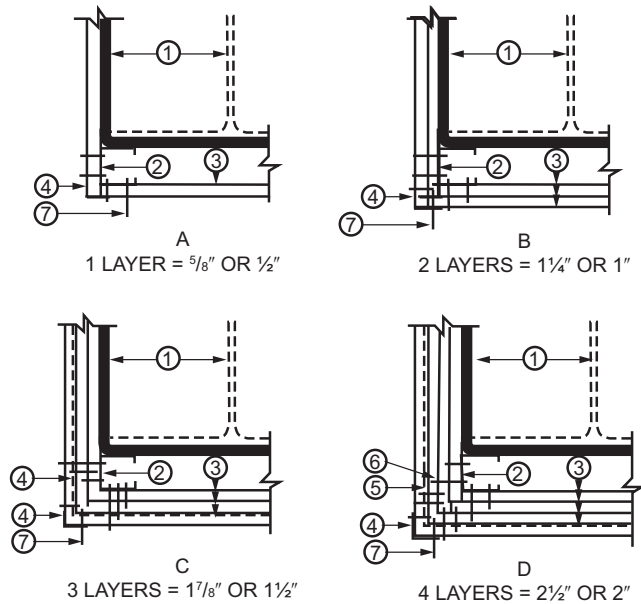
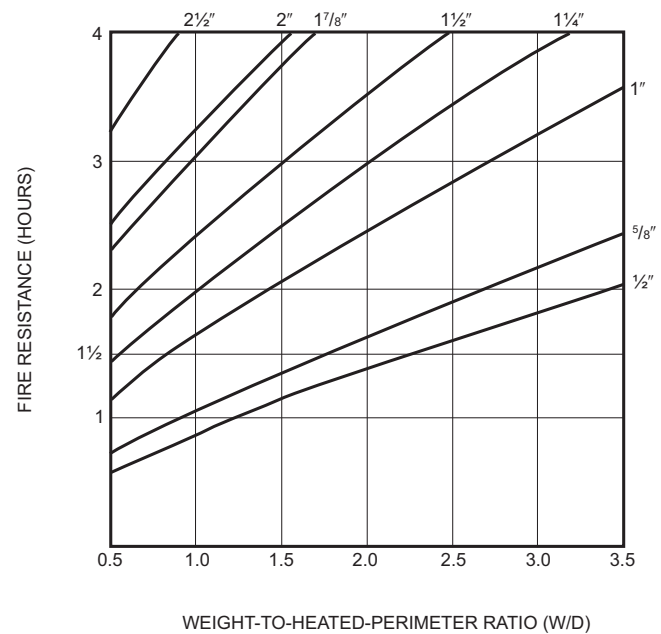


FIGURE 722.5.1(3)
GYPSUM-PROTECTED STRUCTURAL STEEL COLUMNS
WITH STEEL STUD/SCREW ATTACHMENT SYSTEM

For SI: 1 inch = 25.4 mm, 1 foot = -305 mm.

1. Structural steel column, either wide flange or tubular shapes.
2. $1\frac{3}{8}$ -inch deep studs fabricated from 0.0179-inch minimum thickness galvanized steel with $1\frac{5}{16}$ or $1\frac{7}{16}$ -inch legs. The length of the steel studs shall be $\frac{1}{2}$ inch less than the height of the assembly.
3. Type X gypsum board or gypsum panel products in accordance with ASTM C177, C1178, C1278, C1396 or C1658. The total thickness of gypsum board or gypsum panel products calculated as h in Section 722.5.1.2 shall be applied vertically to an individual column using one of the following methods:
 1. As a single layer with no horizontal joints.
 2. As multiple layers with no horizontal joints permitted in any layer.
 3. As multiple layers with horizontal joints staggered not less than 12 inches vertically between layers and not less than 8 feet vertically in any single layer. The total required thickness of gypsum board or gypsum panel products shall be determined on the basis of the specified *fire-resistance rating* and the weight-to-heated-perimeter ratio (W/D) of the column.
4. Galvanized 0.0149-inch minimum thickness steel corner beads with $1\frac{1}{2}$ -inch legs attached to the gypsum board or gypsum panel products with 1-inch-long Type S screws spaced 12 inches on center.
5. No. 18 SWG steel tie wires spaced 24 inches on center.
6. Sheet metal angles with 2-inch legs fabricated from 0.0221-inch minimum thickness galvanized steel.
7. Type S screws, 1 inch long, shall be used for attaching the first layer of gypsum board or gypsum panel product to the steel studs and the third layer to the sheet metal angles at 24 inches on center. Type S screws $1\frac{3}{4}$ -inch long shall be used for attaching the second layer of gypsum board or gypsum panel product to the steel studs and the fourth layer to the sheet metal angles at 12 inches on center. Type S screws $2\frac{1}{4}$ inches long shall be used for attaching the third layer of gypsum board or gypsum panel product to the steel studs at 12 inches on center.



For SI: 1 inch = 25.4 mm, 1 pound per linear foot/inch = 0.059 kg/m/mm.

FIGURE 722.5.1(4)
FIRE RESISTANCE OF STRUCTURAL
STEEL COLUMNS PROTECTED WITH VARIOUS
THICKNESSES OF TYPE X GYPSUM WALLBOARD

- a. The W/D ratios for typical wide flange columns are listed in Table 722.5.1(1). For other column shapes, the W/D ratios shall be determined in accordance with Section 722.5.1.1.

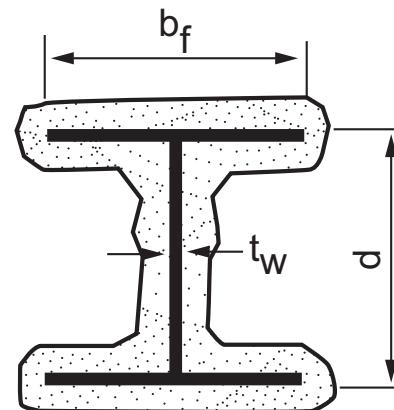


FIGURE 722.5.1(5)
WIDE FLANGE STRUCTURAL STEEL COLUMNS WITH
SPRAYED FIRE-RESISTANT MATERIALS

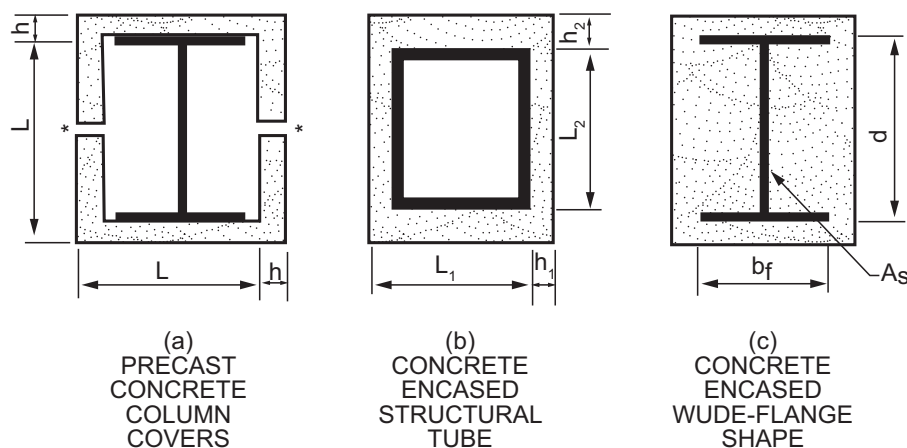


FIGURE 722.5.1(6)
CONCRETE PROTECTED STRUCTURAL STEEL COLUMNS^{a,b}

- a. When the inside perimeter of the concrete protection is not square, L shall be taken as the average of L_1 and L_2 . When the thickness of concrete cover is not constant, h shall be taken as the average of h_1 and h_2 .
- b. Joints shall be protected with a minimum 1 inch thickness of ceramic fiber blanket but in no case less than one-half the thickness of the column cover (see Section 722.2.1.3).

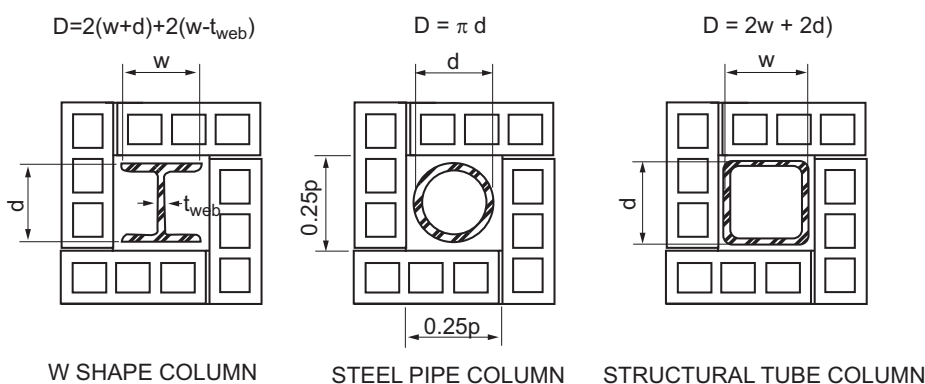


FIGURE 722.5.1(7)
CONCRETE OR CLAY MASONRY PROTECTED STRUCTURAL STEEL COLUMNS

^aor SI: 1 inch = 25.4 mm.

l = Depth of a wide flange column, outside diameter of pipe column, or outside dimension of structural tubing column (inches).

t_{web} = Thickness of web of wide flange column (inches).

w = Width of flange of wide flange column (inches).

722.5.1.1.3 Weight-to-perimeter ratio. Table 722.5.1(1) contains weight-to-heated-perimeter ratios (W/D) for both contour and box fire-resistant profiles, for the wide flange shapes most often used as columns. For different fire-resistant protection profiles or column cross sections, the weight-to-heated-perimeter ratios (W/D) shall be determined in accordance with the definitions given in this section.

722.5.1.2 Gypsum wallboard protection. The fire resistance of structural steel columns with weight-to-heated-perimeter ratios (W/D) less than or equal to 3.65 and that are protected with Type X gypsum wallboard shall be permitted to be determined from the following expression:

$$R = 130 \left[\frac{h(W/D)}{2} \right]^{0.75} \quad \text{(Equation 7-12)}$$

where:

R = Fire resistance (minutes).

h = Total thickness of gypsum wallboard (inches).

D = Heated perimeter of the structural steel column (inches).

W' = Total weight of the structural steel column and gypsum wallboard protection (pounds per linear foot).

$W' = W + 50hD/144$.

722.5.1.2.1 Attachment. The gypsum board or gypsum panel products shall be supported as illustrated in either Figure 722.5.1(2) for fire-resistance ratings of 4 hours or less, or Figure 722.5.1(3) for fire-resistance ratings of 3 hours or less.

722.5.1.2.2 Gypsum wallboard equivalent to concrete. The determination of the *fire resistance* of structural steel columns from Figure 722.5.1(4) is permitted for various thicknesses of gypsum wallboard as a function of the weight-to-heated-perimeter ratio (W/D) of the column. For structural steel columns with weight-to-heated-perimeter ratios (W/D) greater than 3.65, the thickness of gypsum wallboard required for specified *fire-resistance ratings* shall be the same as the thickness determined for a $W14 \times 233$ wide flange shape.

722.5.1.3 Sprayed fire-resistant materials. The *fire resistance* of wide-flange structural steel columns protected with sprayed fire-resistant materials, as illustrated in Figure 722.5.1(5), shall be permitted to be determined from the following expression:

$$R = [C_1(W/D) + C_2]h \quad (\text{Equation 7-13})$$

where:

R = Fire resistance (minutes).

h = Thickness of sprayed fire-resistant material (inches).

D = Heated perimeter of the structural steel column (inches).

C_1 and C_2 = Material-dependent constants.

W = Weight of structural steel columns (pounds per linear foot).

The *fire resistance* of structural steel columns protected with intumescent or mastic fire-resistant coatings shall be determined on the basis of fire-resistance tests in accordance with Section 703.2.

722.5.1.3.1 Material-dependent constants. The material-dependent constants, C_1 and C_2 , shall be determined for specific fire-resistant materials on the basis of standard fire endurance tests in accordance with Section 703.2. Unless evidence is submitted to the *building official* substantiating a broader application, this expression shall be limited to determining the *fire resistance* of structural steel columns with weight-to-heated-perimeter ratios (W/D) between the largest and smallest columns for which standard fire-resistance test results are available.

722.5.1.3.2 Identification. Sprayed fire-resistant materials shall be identified by density and thickness required for a given *fire-resistance rating*.

722.5.1.4 Concrete-protected columns. The *fire resistance* of structural steel columns protected with concrete, as illustrated in Figure 722.5.1(6)(a) and (b), shall be permitted to be determined from the following expression:

$$R = R_o(1 + 0.03m) \quad (\text{Equation 7-14})$$

where:

$$R_o = 10 (W/D)^{0.7} + 17 (h^{1.6}/k_c^{0.2}) \times [1 + 26 \{H/p_c c_c h (L + h)\}^{0.8}]$$

As used in these expressions:

R = Fire endurance at equilibrium moisture conditions (minutes).

R_o = Fire endurance at zero moisture content (minutes).

m = Equilibrium moisture content of the concrete by volume (percent).

W = Average weight of the structural steel column (pounds per linear foot).

D = Heated perimeter of the structural steel column (inches).

h = Thickness of the concrete cover (inches).

k_c = Ambient temperature thermal conductivity of the concrete (Btu/hr ft °F).

H = Ambient temperature thermal capacity of the steel column = $0.11W$ (Btu/ft °F).

p_c = Concrete density (pounds per cubic foot).

c_c = Ambient temperature specific heat of concrete (Btu/lb °F).

L = Interior dimension of one side of a square concrete box protection (inches).

722.5.1.4.1 Reentrant space filled. For wide-flange structural steel columns completely encased in concrete with all reentrant spaces filled [Figure 722.5.1(6)(c)], the thermal capacity of the concrete within the reentrant spaces shall be permitted to be added to the thermal capacity of the steel column, as follows:

$$H = 0.11 W + (p_c c_c / 144) (b_f d - A_s) \quad (\text{Equation 7-15})$$

where:

b_f = Flange width of the structural steel column (inches).

d = Depth of the structural steel column (inches).

A_s = Cross-sectional area of the steel column (square inches).

722.5.1.4.2 Concrete properties unknown. If specific data on the properties of concrete are not available, the values given in Table 722.5.1(2) are permitted.

722.5.1.4.3 Minimum concrete cover. For structural steel column encased in concrete with all reentrant spaces filled, Figure 722.5.1(6)(c) and Tables 722.5.1(7) and 722.5.1(8) indicate the thickness of concrete cover required for various *fire-resistance ratings* for typical wide-flange sections. The thicknesses of concrete indicated in these tables apply to structural steel columns larger than those listed.

722.5.1.4.4 Minimum precast concrete cover. For structural steel columns protected with precast concrete column covers as shown in Figure 722.5.1(6)(a), Tables 722.5.1(9) and 722.5.1(10) indicate the thickness of the column covers required for various *fire-resistance ratings* for typical wide-

flange shapes. The thicknesses of concrete given in these tables apply to structural steel columns larger than those listed.

722.5.1.4.5 Masonry protection. The *fire resistance* of structural steel columns protected with concrete masonry units or clay masonry units as illustrated in Figure 722.5.1(7) shall be permitted to be determined from the following expression:

$$R = 0.17 (W/D)^{0.7} + [0.285 (T_e^{1.6}/K^{0.2})] \\ [1.0 + 42.7 \{ (A_s/d_m T_e)/(0.25p + T_e) \}^{0.8}]$$

(Equation 7-16)

where:

R = Fire-resistance rating of column assembly (hours).

W = Average weight of structural steel column (pounds per foot).

D = Heated perimeter of structural steel column (inches) [see Figure 722.5.1(7)].

T_e = Equivalent thickness of concrete or clay masonry unit (inches) (see Table 722.3.2 Note a or Section 722.4.1).

K = Thermal conductivity of concrete or clay masonry unit (Btu/hr · ft · °F) [see Table 722.5.1(3)].

A_s = Cross-sectional area of structural steel column (square inches).

d_m = Density of the concrete or clay masonry unit (pounds per cubic foot).

p = Inner perimeter of concrete or clay masonry protection (inches) [see Figure 722.5.1(7)].

722.5.1.4.6 Equivalent concrete masonry thickness. For structural steel columns protected with concrete masonry, Table 722.5.1(5) gives the equivalent thickness of concrete masonry required for various *fire-resistance ratings* for typical column shapes. For structural steel columns protected with clay masonry, Table 722.5.1(6) gives the equivalent thickness of concrete masonry required for various *fire-resistance ratings* for typical column shapes.

722.5.2 Structural steel beams and girders. The *fire-resistance ratings* of structural steel beams and girders shall be based upon the size of the element and the type of protection provided in accordance with this section.

722.5.2.1 Determination of fire resistance. These procedures establish a basis for determining resistance of structural steel beams and girders that differ in size from that specified in *approved* fire-resistance-rated assemblies as a function of the thickness of fire-resistant material and the weight (W) and heated perimeter (D) of the beam or girder. As used in these sections, W is the average weight of a *structural steel element* in pounds per linear foot (plf). The heated perimeter, D , is

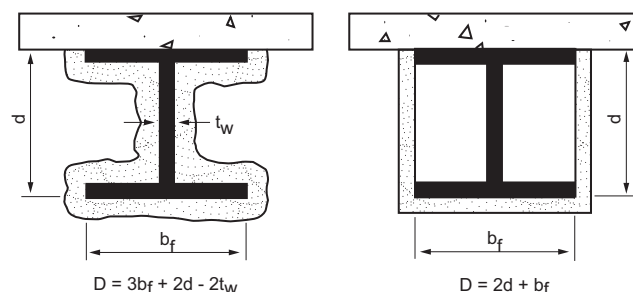


FIGURE 722.5.2
DETERMINATION OF THE HEATED PERIMETER OF
STRUCTURAL STEEL BEAMS AND GIRDERS

the inside perimeter of the fire-resistant material in inches as illustrated in Figure 722.5.2.

722.5.2.1.1 Weight-to-heated perimeter. The weight-to-heated-perimeter ratios (W/D), for both contour and box fire-resistant protection profiles, for the wide flange shapes most often used as beams or girders are given in Table 722.5.1(4). For different shapes, the weight-to-heated-perimeter ratios (W/D) shall be determined in accordance with the definitions given in this section.

722.5.2.1.2 Beam and girder substitutions. Except as provided for in Section 722.5.2.2, structural steel beams in *approved* fire-resistance-rated assemblies shall be considered the minimum permissible size. Other beam or girder shapes shall be permitted to be substituted provided that the weight-to-heated-perimeter ratio (W/D) of the substitute beam is equal to or greater than that of the beam specified in the *approved* assembly.

722.5.2.2 Sprayed fire-resistant materials. The provisions in this section apply to structural steel beams and girders protected with sprayed fire-resistant materials. Larger or smaller beam and girder shapes shall be permitted to be substituted for beams specified in *approved* unrestrained or restrained fire-resistance-rated assemblies, provided that the thickness of the fire-resistant material is adjusted in accordance with the following expression:

$$h_2 = h_1 [(W_1 / D_1) + 0.60] / [(W_2 / D_2) + 0.60]$$

(Equation 7-17)

where:

h = Thickness of sprayed fire-resistant material in inches.

W = Weight of the structural steel beam or girder in pounds per linear foot.

D = Heated perimeter of the structural steel beam in inches.

Subscript 1 refers to the beam and fire-resistant material thickness in the *approved* assembly.

Subscript 2 refers to the substitute beam or girder and the required thickness of fire-resistant material.

FIRE AND SMOKE PROTECTION FEATURES

TABLE 722.5.1(1)
W/D RATIOS FOR STEEL COLUMNS

| STRUCTURAL SHAPE | CONTOUR PROFILE | BOX PROFILE | STRUCTURAL SHAPE | CONTOUR PROFILE | BOX PROFILE |
|------------------|-----------------|-------------|------------------|-----------------|-------------|
| W14 × 233 | 2.55 | 3.65 | W10 × 112 | 1.81 | 2.57 |
| × 211 | 2.32 | 3.35 | × 100 | 1.64 | 2.33 |
| × 193 | 2.14 | 3.09 | × 88 | 1.45 | 2.08 |
| × 176 | 1.96 | 2.85 | × 77 | 1.28 | 1.85 |
| × 159 | 1.78 | 2.60 | × 68 | 1.15 | 1.66 |
| × 145 | 1.64 | 2.39 | × 60 | 1.01 | 1.48 |
| × 132 | 1.56 | 2.25 | × 54 | 0.922 | 1.34 |
| × 120 | 1.42 | 2.06 | × 49 | 0.84 | 1.23 |
| × 109 | 1.29 | 1.88 | × 45 | 0.888 | 1.24 |
| × 99 | 1.18 | 1.72 | × 39 | 0.78 | 1.09 |
| × 90 | 1.08 | 1.58 | × 33 | 0.661 | 0.93 |
| × 82 | 1.23 | 1.68 | | | |
| × 74 | 1.12 | 1.53 | W8 × 67 | 1.37 | 1.94 |
| × 68 | 1.04 | 1.41 | × 58 | 1.20 | 1.71 |
| × 61 | 0.928 | 1.28 | × 48 | 1.00 | 1.44 |
| × 53 | 0.915 | 1.21 | × 40 | 0.849 | 1.23 |
| × 48 | 0.835 | 1.10 | × 35 | 0.749 | 1.08 |
| × 43 | 0.752 | 0.99 | × 31 | 0.665 | 0.97 |
| | | | × 28 | 0.688 | 0.96 |
| | | | × 24 | 0.591 | 0.83 |
| W12 × 190 | 2.50 | 3.51 | × 21 | 0.577 | 0.77 |
| × 170 | 2.26 | 3.20 | × 18 | 0.499 | 0.67 |
| × 152 | 2.04 | 2.90 | | | |
| × 136 | 1.86 | 2.63 | | | |
| × 120 | 1.65 | 2.36 | W6 × 25 | 0.696 | 1.00 |
| × 106 | 1.47 | 2.11 | × 20 | 0.563 | 0.82 |
| × 96 | 1.34 | 1.93 | × 16 | 0.584 | 0.78 |
| × 87 | 1.22 | 1.76 | × 15 | 0.431 | 0.63 |
| × 79 | 1.11 | 1.61 | × 12 | 0.448 | 0.60 |
| × 72 | 1.02 | 1.48 | × 9 | 0.338 | 0.46 |
| × 65 | 0.925 | 1.35 | | | |
| × 58 | 0.925 | 1.31 | W5 × 19 | 0.644 | 0.93 |
| × 53 | 0.855 | 1.20 | × 16 | 0.55 | 0.80 |
| × 50 | 0.909 | 1.23 | | | |
| × 45 | 0.829 | 1.12 | W4 × 13 | 0.556 | 0.79 |
| × 40 | 0.734 | 1.00 | | | |

For SI: 1 pound per linear foot per inch = 0.059 kg/m/mm.

TABLE 722.5.1(2)
PROPERTIES OF CONCRETE

| PROPERTY | NORMAL-WEIGHT CONCRETE | STRUCTURAL LIGHTWEIGHT CONCRETE |
|---|------------------------|---------------------------------|
| Thermal conductivity (k_c) | 0.95 Btu/hr • ft • °F | 0.35 Btu/hr • ft • °F |
| Specific heat (c_c) | 0.20 Btu/lb °F | 0.20 Btu/lb °F |
| Density (P_c) | 145 lb/ft ³ | 110 lb/ft ³ |
| Equilibrium (free) moisture content (m) by volume | 4% | 5% |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 lb/ft³ = 16.0185 kg/m³, Btu/hr • ft • °F = 1.731 W/(m • K).

TABLE 722.5.1(3)
THERMAL CONDUCTIVITY OF CONCRETE OR CLAY MASONRY UNITS

| DENSITY (d_m) OF UNITS (lb/ft ³) | THERMAL CONDUCTIVITY (K) OF UNITS (Btu/hr · ft · °F) |
|--|--|
| Concrete Masonry Units | |
| 80 | 0.207 |
| 85 | 0.228 |
| 90 | 0.252 |
| 95 | 0.278 |
| 100 | 0.308 |
| 105 | 0.340 |
| 110 | 0.376 |
| 115 | 0.416 |
| 120 | 0.459 |
| 125 | 0.508 |
| 130 | 0.561 |
| 135 | 0.620 |
| 140 | 0.685 |
| 145 | 0.758 |
| 150 | 0.837 |
| Clay Masonry Units | |
| 120 | 1.25 |
| 130 | 2.25 |

For SI: 1 pound per cubic foot = 16.0185 kg/m³, Btu/hr · ft · °F = 1.731 W/(m · K).

TABLE 722.5.1(4)
WEIGHT-TO-HEATED-PERIMETER RATIOS (W/D) FOR TYPICAL WIDE FLANGE BEAM AND GIRDER SHAPES

| STRUCTURAL SHAPE | CONTOUR PROFILE | BOX PROFILE | STRUCTURAL SHAPE | CONTOUR PROFILE | BOX PROFILE |
|------------------|-----------------|-------------|------------------|-----------------|-------------|
| W36 × 300 | 2.50 | 3.33 | W24 × 68 | 0.942 | 1.21 |
| × 280 | 2.35 | 3.12 | × 62 | 0.934 | 1.14 |
| × 260 | 2.18 | 2.92 | × 55 | 0.828 | 1.02 |
| × 245 | 2.08 | 2.76 | | | |
| × 230 | 1.95 | 2.61 | W21 × 147 | 1.87 | 2.60 |
| × 210 | 1.96 | 2.45 | × 132 | 1.68 | 2.35 |
| × 194 | 1.81 | 2.28 | × 122 | 1.57 | 2.19 |
| × 182 | 1.72 | 2.15 | × 111 | 1.43 | 2.01 |
| × 170 | 1.60 | 2.01 | × 101 | 1.30 | 1.84 |
| × 160 | 1.51 | 1.90 | × 93 | 1.40 | 1.80 |
| × 150 | 1.43 | 1.79 | × 83 | 1.26 | 1.62 |
| × 135 | 1.29 | 1.63 | × 73 | 1.11 | 1.44 |
| | | | × 68 | 1.04 | 1.35 |

(continued)

TABLE 722.5.1(4)—continued
WEIGHT-TO-HEATED-PERIMETER RATIOS (W/D) FOR TYPICAL WIDE FLANGE BEAM AND GIRDER SHAPES

| STRUCTURAL SHAPE | CONTOUR PROFILE | BOX PROFILE | STRUCTURAL SHAPE | CONTOUR PROFILE | BOX PROFILE |
|------------------|-----------------|-------------|------------------|-----------------|-------------|
| W33 × 241 | 2.13 | 2.86 | W21 × 62 | 0.952 | 1.23 |
| × 221 | 1.97 | 2.64 | × 57 | 0.952 | 1.17 |
| × 201 | 1.79 | 2.42 | × 50 | 0.838 | 1.04 |
| × 152 | 1.53 | 1.94 | × 44 | 0.746 | 0.92 |
| × 141 | 1.43 | 1.80 | | | |
| × 130 | 1.32 | 1.67 | W18 × 119 | 1.72 | 2.42 |
| × 118 | 1.21 | 1.53 | × 106 | 1.55 | 2.18 |
| | | | × 97 | 1.42 | 2.01 |
| W30 × 211 | 2.01 | 2.74 | × 86 | 1.27 | 1.80 |
| × 191 | 1.85 | 2.50 | × 76 | 1.13 | 1.60 |
| × 173 | 1.66 | 2.28 | × 71 | 1.22 | 1.59 |
| × 132 | 1.47 | 1.85 | × 65 | 1.13 | 1.47 |
| × 124 | 1.39 | 1.75 | × 60 | 1.04 | 1.36 |
| × 116 | 1.30 | 1.65 | × 55 | 0.963 | 1.26 |
| × 108 | 1.21 | 1.54 | × 50 | 0.88 | 1.15 |
| × 99 | 1.12 | 1.42 | × 46 | 0.878 | 1.09 |
| | | | × 40 | 0.768 | 0.96 |
| W27 × 178 | 1.87 | 2.55 | × 35 | 0.672 | 0.85 |
| × 161 | 1.70 | 2.33 | | | |
| × 146 | 1.55 | 2.12 | W16 × 100 | 1.59 | 2.25 |
| × 114 | 1.39 | 1.76 | × 89 | 1.43 | 2.03 |
| × 102 | 1.24 | 1.59 | × 77 | 1.25 | 1.78 |
| × 94 | 1.15 | 1.47 | × 67 | 1.09 | 1.56 |
| × 84 | 1.03 | 1.33 | × 57 | 1.09 | 1.43 |
| | | | × 50 | 0.962 | 1.26 |
| | | | × 45 | 0.870 | 1.15 |
| W24 × 162 | 1.88 | 2.57 | × 40 | 0.780 | 1.03 |
| × 146 | 1.70 | 2.34 | × 36 | 0.702 | 0.93 |
| × 131 | 1.54 | 2.12 | × 31 | 0.661 | 0.83 |
| × 117 | 1.38 | 1.91 | × 26 | 0.558 | 0.70 |
| × 104 | 1.24 | 1.71 | | | |
| × 94 | 1.28 | 1.63 | W14 × 132 | 1.89 | 3.00 |
| × 84 | 1.15 | 1.47 | × 120 | 1.71 | 2.75 |
| × 76 | 1.05 | 1.34 | × 109 | 1.57 | 2.52 |
| | | | | | |
| W14 × 99 | 1.43 | 2.31 | W10 × 30 | 0.806 | 1.12 |
| × 90 | 1.31 | 2.11 | × 26 | 0.708 | 0.98 |
| × 82 | 1.45 | 2.12 | × 22 | 0.606 | 0.84 |
| × 74 | 1.32 | 1.93 | × 19 | 0.607 | 0.78 |
| × 68 | 1.22 | 1.78 | × 17 | 0.543 | 0.70 |
| × 61 | 1.10 | 1.61 | × 15 | 0.484 | 0.63 |
| × 53 | 1.06 | 1.48 | × 12 | 0.392 | 0.51 |
| × 48 | 0.970 | 1.35 | | | |

(continued)

TABLE 722.5.1(4)—continued
WEIGHT-TO-HEATED-PERIMETER RATIOS (W/D) FOR TYPICAL WIDE FLANGE BEAM AND GIRDER SHAPES

| STRUCTURAL SHAPE | CONTOUR PROFILE | BOX PROFILE | STRUCTURAL SHAPE | CONTOUR PROFILE | BOX PROFILE |
|------------------|-----------------|-------------|------------------|-----------------|-------------|
| W14 × 43 | 0.874 | 1.22 | W8 × 67 | 1.65 | 2.55 |
| × 38 | 0.809 | 1.09 | × 58 | 1.44 | 2.26 |
| × 34 | 0.725 | 0.98 | × 48 | 1.21 | 1.91 |
| × 30 | 0.644 | 0.87 | × 40 | 1.03 | 1.63 |
| × 26 | 0.628 | 0.79 | × 35 | 0.907 | 1.44 |
| × 22 | 0.534 | 0.68 | × 31 | 0.803 | 1.29 |
| | | | × 28 | 0.819 | 1.24 |
| W12 × 87 | 1.47 | 2.34 | × 24 | 0.704 | 1.07 |
| × 79 | 1.34 | 2.14 | × 21 | 0.675 | 0.96 |
| × 72 | 1.23 | 1.97 | × 18 | 0.583 | 0.84 |
| × 65 | 1.11 | 1.79 | × 15 | 0.551 | 0.74 |
| × 58 | 1.10 | 1.69 | × 13 | 0.483 | 0.65 |
| × 53 | 1.02 | 1.55 | × 10 | 0.375 | 0.51 |
| × 50 | 1.06 | 1.54 | | | |
| × 45 | 0.974 | 1.40 | W6 × 25 | 0.839 | 1.33 |
| × 40 | 0.860 | 1.25 | × 20 | 0.678 | 1.09 |
| × 35 | 0.810 | 1.11 | × 16 | 0.684 | 0.96 |
| × 30 | 0.699 | 0.96 | × 15 | 0.521 | 0.83 |
| × 26 | 0.612 | 0.84 | × 12 | 0.526 | 0.75 |
| × 22 | 0.623 | 0.77 | × 9 | 0.398 | 0.57 |
| × 19 | 0.540 | 0.67 | | | |
| × 16 | 0.457 | 0.57 | W5 × 19 | 0.776 | 1.24 |
| × 14 | 0.405 | 0.50 | × 16 | 0.664 | 1.07 |
| | | | | | |
| W10 × 112 | 2.17 | 3.38 | W4 × 13 | 0.670 | 1.05 |
| × 100 | 1.97 | 3.07 | | | |
| × 88 | 1.74 | 2.75 | | | |
| × 77 | 1.54 | 2.45 | | | |
| × 68 | 1.38 | 2.20 | | | |
| × 60 | 1.22 | 1.97 | | | |
| × 54 | 1.11 | 1.79 | | | |
| × 49 | 1.01 | 1.64 | | | |
| × 45 | 1.06 | 1.59 | | | |
| × 39 | 0.94 | 1.40 | | | |
| × 33 | 0.77 | 1.20 | | | |

For SI: 1 pound per linear foot per inch = 0.059 kg/m/mm.

TABLE 722.5.1(5)
FIRE RESISTANCE OF CONCRETE MASONRY PROTECTED STEEL COLUMNS

| COLUMN SIZE | CONCRETE MASONRY DENSITY POUNDS PER CUBIC FOOT | MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CONCRETE MASONRY PROTECTION ASSEMBLY, T_e (inches) | | | | COLUMN SIZE | CONCRETE MASONRY DENSITY POUNDS PER CUBIC FOOT | MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CONCRETE MASONRY PROTECTION ASSEMBLY, T_e (inches) | | | |
|----------------------------|--|--|---------|---------|---------|--|--|--|---------|---------|---------|
| | | 1 hour | 2 hours | 3 hours | 4 hours | | | 1 hour | 2 hours | 3 hours | 4 hours |
| W14 × 82 | 80 | 0.74 | 1.61 | 2.36 | 3.04 | W10 × 68 | 80 | 0.72 | 1.58 | 2.33 | 3.01 |
| | 100 | 0.89 | 1.85 | 2.67 | 3.40 | | 100 | 0.87 | 1.83 | 2.65 | 3.38 |
| | 110 | 0.96 | 1.97 | 2.81 | 3.57 | | 110 | 0.94 | 1.95 | 2.79 | 3.55 |
| | 120 | 1.03 | 2.08 | 2.95 | 3.73 | | 120 | 1.01 | 2.06 | 2.94 | 3.72 |
| W14 × 68 | 80 | 0.83 | 1.70 | 2.45 | 3.13 | W10 × 54 | 80 | 0.88 | 1.76 | 2.53 | 3.21 |
| | 100 | 0.99 | 1.95 | 2.76 | 3.49 | | 100 | 1.04 | 2.01 | 2.83 | 3.57 |
| | 110 | 1.06 | 2.06 | 2.91 | 3.66 | | 110 | 1.11 | 2.12 | 2.98 | 3.73 |
| | 120 | 1.14 | 2.18 | 3.05 | 3.82 | | 120 | 1.19 | 2.24 | 3.12 | 3.90 |
| W14 × 53 | 80 | 0.91 | 1.81 | 2.58 | 3.27 | W10 × 45 | 80 | 0.92 | 1.83 | 2.60 | 3.30 |
| | 100 | 1.07 | 2.05 | 2.88 | 3.62 | | 100 | 1.08 | 2.07 | 2.90 | 3.64 |
| | 110 | 1.15 | 2.17 | 3.02 | 3.78 | | 110 | 1.16 | 2.18 | 3.04 | 3.80 |
| | 120 | 1.22 | 2.28 | 3.16 | 3.94 | | 120 | 1.23 | 2.29 | 3.18 | 3.96 |
| W14 × 43 | 80 | 1.01 | 1.93 | 2.71 | 3.41 | W10 × 33 | 80 | 1.06 | 2.00 | 2.79 | 3.49 |
| | 100 | 1.17 | 2.17 | 3.00 | 3.74 | | 100 | 1.22 | 2.23 | 3.07 | 3.81 |
| | 110 | 1.25 | 2.28 | 3.14 | 3.90 | | 110 | 1.30 | 2.34 | 3.20 | 3.96 |
| | 120 | 1.32 | 2.38 | 3.27 | 4.05 | | 120 | 1.37 | 2.44 | 3.33 | 4.12 |
| W12 × 72 | 80 | 0.81 | 1.66 | 2.41 | 3.09 | W8 × 40 | 80 | 0.94 | 1.85 | 2.63 | 3.33 |
| | 100 | 0.91 | 1.88 | 2.70 | 3.43 | | 100 | 1.10 | 2.10 | 2.93 | 3.67 |
| | 110 | 0.99 | 1.99 | 2.84 | 3.60 | | 110 | 1.18 | 2.21 | 3.07 | 3.83 |
| | 120 | 1.06 | 2.10 | 2.98 | 3.76 | | 120 | 1.25 | 2.32 | 3.20 | 3.99 |
| W12 × 58 | 80 | 0.88 | 1.76 | 2.52 | 3.21 | W8 × 31 | 80 | 1.06 | 2.00 | 2.78 | 3.49 |
| | 100 | 1.04 | 2.01 | 2.83 | 3.56 | | 100 | 1.22 | 2.23 | 3.07 | 3.81 |
| | 110 | 1.11 | 2.12 | 2.97 | 3.73 | | 110 | 1.29 | 2.33 | 3.20 | 3.97 |
| | 120 | 1.19 | 2.23 | 3.11 | 3.89 | | 120 | 1.36 | 2.44 | 3.33 | 4.12 |
| W12 × 50 | 80 | 0.91 | 1.81 | 2.58 | 3.27 | W8 × 24 | 80 | 1.14 | 2.09 | 2.89 | 3.59 |
| | 100 | 1.07 | 2.05 | 2.88 | 3.62 | | 100 | 1.29 | 2.31 | 3.16 | 3.90 |
| | 110 | 1.15 | 2.17 | 3.02 | 3.78 | | 110 | 1.36 | 2.42 | 3.28 | 4.05 |
| | 120 | 1.22 | 2.28 | 3.16 | 3.94 | | 120 | 1.43 | 2.52 | 3.41 | 4.20 |
| W12 × 40 | 80 | 1.01 | 1.94 | 2.72 | 3.41 | W8 × 18 | 80 | 1.22 | 2.20 | 3.01 | 3.72 |
| | 100 | 1.17 | 2.17 | 3.01 | 3.75 | | 100 | 1.36 | 2.40 | 3.25 | 4.01 |
| | 110 | 1.25 | 2.28 | 3.14 | 3.90 | | 110 | 1.42 | 2.50 | 3.37 | 4.14 |
| | 120 | 1.32 | 2.39 | 3.27 | 4.06 | | 120 | 1.48 | 2.59 | 3.49 | 4.28 |
| 4 × 4 × 1/2 wall thickness | 80 | 0.93 | 1.90 | 2.71 | 3.43 | 4 double extra strong 0.674 wall thickness | 80 | 0.80 | 1.75 | 2.56 | 3.28 |
| | 100 | 1.08 | 2.13 | 2.99 | 3.76 | | 100 | 0.95 | 1.99 | 2.85 | 3.62 |
| | 110 | 1.16 | 2.24 | 3.13 | 3.91 | | 110 | 1.02 | 2.10 | 2.99 | 3.78 |
| | 120 | 1.22 | 2.34 | 3.26 | 4.06 | | 120 | 1.09 | 2.20 | 3.12 | 3.93 |
| 4 × 4 × 3/8 wall thickness | 80 | 1.05 | 2.03 | 2.84 | 3.57 | 4 extra strong 0.337 wall thickness | 80 | 1.12 | 2.11 | 2.93 | 3.65 |
| | 100 | 1.20 | 2.25 | 3.11 | 3.88 | | 100 | 1.26 | 2.32 | 3.19 | 3.95 |
| | 110 | 1.27 | 2.35 | 3.24 | 4.02 | | 110 | 1.33 | 2.42 | 3.31 | 4.09 |
| | 120 | 1.34 | 2.45 | 3.37 | 4.17 | | 120 | 1.40 | 2.52 | 3.43 | 4.23 |

(continued)

TABLE 722.5.1(5)—continued
FIRE RESISTANCE OF CONCRETE MASONRY PROTECTED STEEL COLUMNS

| COLUMN SIZE | CONCRETE MASONRY DENSITY POUNDS PER CUBIC FOOT | MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CONCRETE MASONRY PROTECTION ASSEMBLY, T_e (inches) | | | | COLUMN SIZE | CONCRETE MASONRY DENSITY POUNDS PER CUBIC FOOT | MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CONCRETE MASONRY PROTECTION ASSEMBLY, T_e (inches) | | | |
|--|--|--|---------|---------|---------|--|--|--|---------|---------|---------|
| | | 1 hour | 2 hours | 3 hours | 4 hours | | | 1 hour | 2 hours | 3 hours | 4 hours |
| $4 \times 4 \times \frac{1}{4}$ wall thickness | 80 | 1.21 | 2.20 | 3.01 | 3.73 | 4 standard 0.237 wall thickness | 80 | 1.26 | 2.25 | 3.07 | 3.79 |
| | 100 | 1.35 | 2.40 | 3.26 | 4.02 | | 100 | 1.40 | 2.45 | 3.31 | 4.07 |
| | 110 | 1.41 | 2.50 | 3.38 | 4.16 | | 110 | 1.46 | 2.55 | 3.43 | 4.21 |
| | 120 | 1.48 | 2.59 | 3.50 | 4.30 | | 120 | 1.53 | 2.64 | 3.54 | 4.34 |
| $6 \times 6 \times \frac{1}{2}$ wall thickness | 80 | 0.82 | 1.75 | 2.54 | 3.25 | 5 double extra strong 0.750 wall thickness | 80 | 0.70 | 1.61 | 2.40 | 3.12 |
| | 100 | 0.98 | 1.99 | 2.84 | 3.59 | | 100 | 0.85 | 1.86 | 2.71 | 3.47 |
| | 110 | 1.05 | 2.10 | 2.98 | 3.75 | | 110 | 0.91 | 1.97 | 2.85 | 3.63 |
| | 120 | 1.12 | 2.21 | 3.11 | 3.91 | | 120 | 0.98 | 2.02 | 2.99 | 3.79 |
| $6 \times 6 \times \frac{3}{8}$ wall thickness | 80 | 0.96 | 1.91 | 2.71 | 3.42 | 5 extra strong 0.375 wall thickness | 80 | 1.04 | 2.01 | 2.83 | 3.54 |
| | 100 | 1.12 | 2.14 | 3.00 | 3.75 | | 100 | 1.19 | 2.23 | 3.09 | 3.85 |
| | 110 | 1.19 | 2.25 | 3.13 | 3.90 | | 110 | 1.26 | 2.34 | 3.22 | 4.00 |
| | 120 | 1.26 | 2.35 | 3.26 | 4.05 | | 120 | 1.32 | 2.44 | 3.34 | 4.14 |
| $6 \times 6 \times \frac{1}{4}$ wall thickness | 80 | 1.14 | 2.11 | 2.92 | 3.63 | 5 standard 0.258 wall thickness | 80 | 1.20 | 2.19 | 3.00 | 3.72 |
| | 100 | 1.29 | 2.32 | 3.18 | 3.93 | | 100 | 1.34 | 2.39 | 3.25 | 4.00 |
| | 110 | 1.36 | 2.43 | 3.30 | 4.08 | | 110 | 1.41 | 2.49 | 3.37 | 4.14 |
| | 120 | 1.42 | 2.52 | 3.43 | 4.22 | | 120 | 1.47 | 2.58 | 3.49 | 4.28 |
| $8 \times 8 \times \frac{1}{2}$ wall thickness | 80 | 0.77 | 1.66 | 2.44 | 3.13 | 6 double extra strong 0.864 wall thickness | 80 | 0.59 | 1.46 | 2.23 | 2.92 |
| | 100 | 0.92 | 1.91 | 2.75 | 3.49 | | 100 | 0.73 | 1.71 | 2.54 | 3.29 |
| | 110 | 1.00 | 2.02 | 2.89 | 3.66 | | 110 | 0.80 | 1.82 | 2.69 | 3.47 |
| | 120 | 1.07 | 2.14 | 3.03 | 3.82 | | 120 | 0.86 | 1.93 | 2.83 | 3.63 |
| $8 \times 8 \times \frac{3}{8}$ wall thickness | 80 | 0.91 | 1.84 | 2.63 | 3.33 | 6 extra strong 0.432 wall thickness | 80 | 0.94 | 1.90 | 2.70 | 3.42 |
| | 100 | 1.07 | 2.08 | 2.92 | 3.67 | | 100 | 1.10 | 2.13 | 2.98 | 3.74 |
| | 110 | 1.14 | 2.19 | 3.06 | 3.83 | | 110 | 1.17 | 2.23 | 3.11 | 3.89 |
| | 120 | 1.21 | 2.29 | 3.19 | 3.98 | | 120 | 1.24 | 2.34 | 3.24 | 4.04 |
| $8 \times 8 \times \frac{1}{4}$ wall thickness | 80 | 1.10 | 2.06 | 2.86 | 3.57 | 6 standard 0.280 wall thickness | 80 | 1.14 | 2.12 | 2.93 | 3.64 |
| | 100 | 1.25 | 2.28 | 3.13 | 3.87 | | 100 | 1.29 | 2.33 | 3.19 | 3.94 |
| | 110 | 1.32 | 2.38 | 3.25 | 4.02 | | 110 | 1.36 | 2.43 | 3.31 | 4.08 |
| | 120 | 1.39 | 2.48 | 3.38 | 4.17 | | 120 | 1.42 | 2.53 | 3.43 | 4.22 |

For SI: 1 inch = 25.4 mm, 1 pound per cubic foot = 16.02 kg/m³.

Note: Tabulated values assume 1-inch air gap between masonry and steel section.

TABLE 722.5.1(6)
FIRE RESISTANCE OF CLAY MASONRY PROTECTED STEEL COLUMNS

| COLUMN SIZE | CLAY MASONRY DENSITY, POUNDS PER CUBIC FOOT | MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CLAY MASONRY PROTECTION ASSEMBLY, T_e (inches) | | | | COLUMN SIZE | CLAY MASONRY DENSITY, POUNDS PER CUBIC FOOT | MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CLAY MASONRY PROTECTION ASSEMBLY, T_e (inches) | | | |
|----------------------------|---|--|---------|---------|---------|--|---|--|---------|---------|---------|
| | | 1 hour | 2 hours | 3 hours | 4 hours | | | 1 hour | 2 hours | 3 hours | 4 hours |
| W14 × 82 | 120 | 1.23 | 2.42 | 3.41 | 4.29 | W10 × 68 | 120 | 1.27 | 2.46 | 3.26 | 4.35 |
| | 130 | 1.40 | 2.70 | 3.78 | 4.74 | | 130 | 1.44 | 2.75 | 3.83 | 4.80 |
| W14 × 68 | 120 | 1.34 | 2.54 | 3.54 | 4.43 | W10 × 54 | 120 | 1.40 | 2.61 | 3.62 | 4.51 |
| | 130 | 1.51 | 2.82 | 3.91 | 4.87 | | 130 | 1.58 | 2.89 | 3.98 | 4.95 |
| W14 × 53 | 120 | 1.43 | 2.65 | 3.65 | 4.54 | W10 × 45 | 120 | 1.44 | 2.66 | 3.67 | 4.57 |
| | 130 | 1.61 | 2.93 | 4.02 | 4.98 | | 130 | 1.62 | 2.95 | 4.04 | 5.01 |
| W14 × 43 | 120 | 1.54 | 2.76 | 3.77 | 4.66 | W10 × 33 | 120 | 1.59 | 2.82 | 3.84 | 4.73 |
| | 130 | 1.72 | 3.04 | 4.13 | 5.09 | | 130 | 1.77 | 3.10 | 4.20 | 5.13 |
| W12 × 72 | 120 | 1.32 | 2.52 | 3.51 | 4.40 | W8 × 40 | 120 | 1.47 | 2.70 | 3.71 | 4.61 |
| | 130 | 1.50 | 2.80 | 3.88 | 4.84 | | 130 | 1.65 | 2.98 | 4.08 | 5.04 |
| W12 × 58 | 120 | 1.40 | 2.61 | 3.61 | 4.50 | W8 × 31 | 120 | 1.59 | 2.82 | 3.84 | 4.73 |
| | 130 | 1.57 | 2.89 | 3.98 | 4.94 | | 130 | 1.77 | 3.10 | 4.20 | 5.17 |
| W12 × 50 | 120 | 1.43 | 2.65 | 3.66 | 4.55 | W8 × 24 | 120 | 1.66 | 2.90 | 3.92 | 4.82 |
| | 130 | 1.61 | 2.93 | 4.02 | 4.99 | | 130 | 1.84 | 3.18 | 4.28 | 5.25 |
| W12 × 40 | 120 | 1.54 | 2.77 | 3.78 | 4.67 | W8 × 18 | 120 | 1.75 | 3.00 | 4.01 | 4.91 |
| | 130 | 1.72 | 3.05 | 4.14 | 5.10 | | 130 | 1.93 | 3.27 | 4.37 | 5.34 |
| STEEL TUBING | | | | | | STEEL PIPE | | | | | |
| NOMINAL TUBE SIZE (inches) | CLAY MASONRY DENSITY, POUNDS PER CUBIC FOOT | MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CLAY MASONRY PROTECTION ASSEMBLY, T_e (inches) | | | | NOMINAL PIPE SIZE (inches) | CLAY MASONRY DENSITY, POUNDS PER CUBIC FOOT | MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CLAY MASONRY PROTECTION ASSEMBLY, T_e (inches) | | | |
| | | 1 hour | 2 hours | 3 hours | 4 hours | | | 1 hour | 2 hours | 3 hours | 4 hours |
| 4 × 4 × 1/2 wall thickness | 120 | 1.44 | 2.72 | 3.76 | 4.68 | 4 double extra strong 0.674 wall thickness | 120 | 1.26 | 2.55 | 3.60 | 4.52 |
| | 130 | 1.62 | 3.00 | 4.12 | 5.11 | | 130 | 1.42 | 2.82 | 3.96 | 4.95 |
| 4 × 4 × 3/8 wall thickness | 120 | 1.56 | 2.84 | 3.88 | 4.78 | 4 extra strong 0.337 wall thickness | 120 | 1.60 | 2.89 | 3.92 | 4.83 |
| | 130 | 1.74 | 3.12 | 4.23 | 5.21 | | 130 | 1.77 | 3.16 | 4.28 | 5.25 |
| 4 × 4 × 1/4 wall thickness | 120 | 1.72 | 2.99 | 4.02 | 4.92 | 4 standard 0.237 wall thickness | 120 | 1.74 | 3.02 | 4.05 | 4.95 |
| | 130 | 1.89 | 3.26 | 4.37 | 5.34 | | 130 | 1.92 | 3.29 | 4.40 | 5.37 |
| 6 × 6 × 1/2 wall thickness | 120 | 1.33 | 2.58 | 3.62 | 4.52 | 5 double extra strong 0.750 wall thickness | 120 | 1.17 | 2.44 | 3.48 | 4.40 |
| | 130 | 1.50 | 2.86 | 3.98 | 4.96 | | 130 | 1.33 | 2.72 | 3.84 | 4.83 |
| 6 × 6 × 3/8 wall thickness | 120 | 1.48 | 2.74 | 3.76 | 4.67 | 5 extra strong 0.375 wall thickness | 120 | 1.55 | 2.82 | 3.85 | 4.76 |
| | 130 | 1.65 | 3.01 | 4.13 | 5.10 | | 130 | 1.72 | 3.09 | 4.21 | 5.18 |
| 6 × 6 × 1/4 wall thickness | 120 | 1.66 | 2.91 | 3.94 | 4.84 | 5 standard 0.258 wall thickness | 120 | 1.71 | 2.97 | 4.00 | 4.90 |
| | 130 | 1.83 | 3.19 | 4.30 | 5.27 | | 130 | 1.88 | 3.24 | 4.35 | 5.32 |
| 8 × 8 × 1/2 wall thickness | 120 | 1.27 | 2.50 | 3.52 | 4.42 | 6 double extra strong 0.864 wall thickness | 120 | 1.04 | 2.28 | 3.32 | 4.23 |
| | 130 | 1.44 | 2.78 | 3.89 | 4.86 | | 130 | 1.19 | 2.60 | 3.68 | 4.67 |
| 8 × 8 × 3/8 wall thickness | 120 | 1.43 | 2.67 | 3.69 | 4.59 | 6 extra strong 0.432 wall thickness | 120 | 1.45 | 2.71 | 3.75 | 4.65 |
| | 130 | 1.60 | 2.95 | 4.05 | 5.02 | | 130 | 1.62 | 2.99 | 4.10 | 5.08 |
| 8 × 8 × 1/4 wall thickness | 120 | 1.62 | 2.87 | 3.89 | 4.78 | 6 standard 0.280 wall thickness | 120 | 1.65 | 2.91 | 3.94 | 4.84 |
| | 130 | 1.79 | 3.14 | 4.24 | 5.21 | | 130 | 1.82 | 3.19 | 4.30 | 5.27 |

TABLE 722.5.1(7)
MINIMUM COVER (inch) FOR STEEL COLUMNS ENCASED IN
NORMAL-WEIGHT CONCRETE^a [FIGURE 722.5.1(6)(c)]

| STRUCTURAL SHAPE | FIRE-RESISTANCE RATING (hours) | | | | | | |
|------------------|--------------------------------|----|----|----|----|---|----|
| | 1 | 1½ | 2 | 3 | 4 | | |
| W14 × 233 | 1 | 1 | 1 | 1½ | 2 | | |
| × 176 | | | | 2½ | | | |
| × 132 | | | | | 2 | | |
| × 90 | | 1½ | 2½ | | | | |
| × 61 | | | | 3 | | | |
| × 48 | | | | | | | |
| × 43 | | | | | | | |
| W12 × 152 | 1 | 1 | 1 | 2 | 2½ | | |
| × 96 | | 1½ | 1½ | 2½ | 3 | | |
| × 65 | | | | | | | |
| × 50 | | | | | | | |
| × 40 | | | | | | | |
| W10 × 88 | 1 | 1½ | 1½ | 2 | 3 | | |
| × 49 | 1 | | | 2½ | 3½ | | |
| × 45 | | | | | | | |
| × 39 | | | | | | | |
| × 33 | | | | | | 2 | |
| W8 × 67 | 1 | 1 | 1½ | 2½ | 3 | | |
| × 58 | | 1½ | | | 2 | 3 | 3½ |
| × 48 | | | | | | | |
| × 31 | | | | | | | |
| × 21 | | | | | | | |
| × 18 | | | 4 | | | | |
| W6 × 25 | 1 | 1½ | 2 | 3 | 3½ | | |
| × 20 | | 2 | 2½ | | 3½ | 4 | |
| × 16 | | | | | | | |
| × 15 | | | | 1½ | | | |
| × 9 | | | | | | | |

For SI: 1 inch = 25.4 mm.

a. The tabulated thicknesses are based upon the assumed properties of normal-weight concrete given in Table 722.5.1(2).

TABLE 722.5.1(8)
MINIMUM COVER (inch) FOR STEEL COLUMNS
ENCASED IN STRUCTURAL LIGHTWEIGHT CONCRETE^a
[FIGURE 722.5.1(6)(c)]

| STRUCTURAL SHAPE | FIRE-RESISTANCE RATING (HOURS) | | | | |
|------------------|--------------------------------|----|----|----|----|
| | 1 | 1½ | 2 | 3 | 4 |
| W14 × 233 | 1 | 1 | 1 | 1 | 1½ |
| × 193 | | | | 1½ | 2 |
| × 74 | | | | | |
| × 61 | | | | 2 | 2½ |
| × 43 | | | | | |
| W12 × 65 | 1 | 1 | 1 | 1½ | 2 |
| × 53 | | | 1½ | 2 | 2½ |
| × 40 | | | | 2 | 2½ |
| W10 × 112 | 1 | 1 | 1 | 1½ | 2 |
| × 88 | | | 1½ | | |
| × 60 | | | | | |
| × 33 | | | | | |
| W8 × 35 | 1 | 1 | 1½ | 2 | 2½ |
| × 28 | | | | 2½ | 3 |
| × 24 | | | | | |
| × 18 | | | | | |

For SI: 1 inch = 25.4 mm.

a. The tabulated thicknesses are based upon the assumed properties of structural lightweight concrete given in Table 722.5.1(2).

FIRE AND SMOKE PROTECTION FEATURES

TABLE 722.5.1(9)
MINIMUM COVER (inch) FOR STEEL COLUMNS IN NORMAL-WEIGHT PRECAST COVERS^a [FIGURE 722.5.1(6)(a)]

| STRUCTURAL SHAPE | FIRE-RESISTANCE RATING (hours) | | | | |
|------------------|--------------------------------|----|----|----|----|
| | 1 | 1½ | 2 | 3 | 4 |
| W14 × 233 | 1½ | 1½ | 1½ | 2½ | 3 |
| × 211 | | | 2 | | 3½ |
| × 176 | | | | | |
| × 145 | | 2 | 2½ | 3 | 4 |
| × 109 | | | | | |
| × 99 | | | 3½ | 4½ | |
| × 61 | | | | | |
| × 43 | | | | | |
| W12 × 190 | 1½ | 1½ | 1½ | 2½ | 3½ |
| × 152 | | | 2 | | |
| × 120 | | | 2 | 2½ | 3 |
| × 96 | | | | | |
| × 87 | | 3½ | | 4½ | |
| × 58 | | | | | |
| × 40 | | | | | |
| W10 × 112 | | 1½ | 1½ | 2 | 3 |
| × 88 | 2½ | | | 3½ | |
| × 77 | | | | | |
| × 54 | | | 4½ | | |
| × 33 | | | | | |
| W8 × 67 | 1½ | 1½ | 2 | 3 | 4 |
| × 58 | | | 2½ | 3½ | |
| × 48 | | | | | |
| × 28 | | 2½ | | | 3 |
| × 21 | | | | | |
| × 18 | | | | | |
| W6 × 25 | 1½ | 2 | 2½ | 3½ | 4½ |
| × 20 | | 2½ | | | |
| × 16 | | | 4 | | |
| × 12 | | 2 | | 5 | |
| × 9 | | | | | |

For SI: 1 inch = 25.4 mm.

a. The tabulated thicknesses are based upon the assumed properties of normal-weight concrete given in Table 722.5.1(2).

TABLE 722.5.1(10)
MINIMUM COVER (inch) FOR STEEL COLUMNS IN STRUCTURAL LIGHTWEIGHT PRECAST COVERS^a [FIGURE 722.5.1(6)(a)]

| STRUCTURAL SHAPE | FIRE-RESISTANCE RATING (hours) | | | | |
|------------------|--------------------------------|----|----|----|----|
| | 1 | 1½ | 2 | 3 | 4 |
| W14 × 233 | 1½ | 1½ | 1½ | 2 | 2½ |
| × 176 | | | 2½ | 3 | 3½ |
| × 145 | | | | | |
| × 132 | | | | | |
| × 109 | | | | | |
| × 99 | | | 2 | 3 | 3½ |
| × 68 | | | | | |
| × 43 | | | | | |
| W12 × 190 | | | 1½ | 2 | 2½ |
| × 152 | | | 2½ | 3 | 3½ |
| × 136 | | | | | |
| × 106 | | | | | |
| × 96 | | | | | |
| × 87 | | | | | |
| × 65 | | | | | |
| × 40 | | | | | |
| W10 × 112 | 1½ | 1½ | 1½ | 2 | 3 |
| × 100 | | | 2 | 3 | 3½ |
| × 88 | | | | | |
| × 77 | | | | | |
| × 60 | | | | | |
| × 39 | | | 2 | 3 | 3½ |
| × 33 | | | | | |
| W8 × 67 | 1½ | 1½ | 1½ | 2½ | 3 |
| × 48 | | | 2 | 3 | 3½ |
| × 35 | | | | | |
| × 28 | | | | | |
| × 18 | | | | | |
| W6 × 25 | 1½ | 2 | 2 | 3 | 3½ |
| × 15 | | | 2½ | 3½ | 4 |
| × 9 | | | | | |
| × 9 | | | | | |

For SI: 1 inch = 25.4 mm.

a. The tabulated thicknesses are based upon the assumed properties of structural lightweight concrete given in Table 722.5.1(2).

The *fire resistance* of structural steel beams and girders protected with intumescent or mastic fire-resistant coatings shall be determined on the basis of fire-resistance tests in accordance with Section 703.2.

722.5.2.2.1 Minimum thickness. The use of Equation 7-17 is subject to the following conditions:

1. The weight-to-heated-perimeter ratio for the substitute beam or girder (W_2/D_2) shall be not less than 0.37.
2. The thickness of fire protection materials calculated for the substitute beam or girder (T_1) shall be not less than $\frac{3}{8}$ inch (9.5 mm).
3. The unrestrained or restrained beam rating shall be not less than 1 hour.
4. Where used to adjust the material thickness for a restrained beam, the use of this procedure is limited to structural steel sections classified as compact in accordance with AISC 360.

722.5.2.3 Structural steel trusses. The *fire resistance* of structural steel trusses protected with fire-resistant materials sprayed to each of the individual truss elements shall be permitted to be determined in accordance with this section. The thickness of the fire-resistant material shall be determined in accordance with Section 722.5.1.3. The weight-to-heated-perimeter ratio (W/D) of truss elements that can be simultaneously exposed to fire on all sides shall be determined on the same basis as columns, as specified in Section 722.5.1.1. The weight-to-heated-perimeter ratio (W/D) of truss elements that directly support floor or roof assembly shall be determined on the same basis as beams and girders, as specified in Section 722.5.2.1.

The *fire resistance* of structural steel trusses protected with intumescent or mastic fire-resistant coatings shall be determined on the basis of fire-resistance tests in accordance with Section 703.2.

722.6 Wood assemblies. The provisions of this section contain procedures by which the *fire-resistance ratings* of wood assemblies are established by calculations.

722.6.1 General. This section contains procedures for calculating the *fire-resistance ratings* of walls, floor/ceiling and roof/ceiling assemblies based in part on the standard method of testing referenced in Section 703.2.

722.6.1.1 Maximum fire-resistance rating. *Fire-resistance ratings* calculated for assemblies using the methods in Section 722.6 shall be limited to a maximum of 1 hour.

722.6.1.2 Dissimilar membranes. Where dissimilar membranes are used on a wall assembly that requires consideration of fire exposure from both sides, the calculation shall be made from the least fire-resistant (weaker) side.

722.6.2 Walls, floors and roofs. These procedures apply to both load-bearing and nonload-bearing assemblies.

722.6.2.1 Fire-resistance rating of wood frame assemblies. The *fire-resistance rating* of a wood frame assembly is equal to the sum of the time assigned to the membrane on the fire-exposed side, the time assigned to the framing members and the time assigned for additional contribution by other protective measures such as insulation. The membrane on the unexposed side shall not be included in determining the *fire resistance* of the assembly.

722.6.2.2 Time assigned to membranes. Table 722.6.2(1) indicates the time assigned to membranes on the fire-exposed side.

722.6.2.3 Exterior walls. For an exterior wall with a *fire separation distance* greater than 10 feet (3048 mm), the wall is assigned a rating dependent on the interior membrane and the framing as described in Tables 722.6.2(1) and 722.6.2(2). The membrane on the outside of the nonfire-exposed side of exterior walls with a *fire separation distance* greater than 10 feet (3048 mm) shall consist of sheathing, sheathing paper and siding as described in Table 722.6.2(3).

TABLE 722.6.2(1)
TIME ASSIGNED TO WALLBOARD MEMBRANES^{a, b, c, d}

| DESCRIPTION OF FINISH | TIME ^e (minutes) |
|---|-----------------------------|
| $\frac{3}{8}$ -inch wood structural panel bonded with exterior glue | 5 |
| $\frac{15}{32}$ -inch wood structural panel bonded with exterior glue | 10 |
| $\frac{19}{32}$ -inch wood structural panel bonded with exterior glue | 15 |
| $\frac{3}{8}$ -inch gypsum wallboard | 10 |
| $\frac{1}{2}$ -inch gypsum wallboard | 15 |
| $\frac{5}{8}$ -inch gypsum wallboard | 30 |
| $\frac{1}{2}$ -inch Type X gypsum wallboard | 25 |
| $\frac{5}{8}$ -inch Type X gypsum wallboard | 40 |
| Double $\frac{3}{8}$ -inch gypsum wallboard | 25 |
| $\frac{1}{2}$ -inch + $\frac{3}{8}$ -inch gypsum wallboard | 35 |
| Double $\frac{1}{2}$ -inch gypsum wallboard | 40 |

For SI: 1 inch = 25.4 mm.

- a. These values apply only where membranes are installed on framing members that are spaced 16 inches o.c. or less.
- b. Gypsum wallboard installed over framing or furring shall be installed so that all edges are supported, except $\frac{5}{8}$ -inch Type X gypsum wallboard shall be permitted to be installed horizontally with the horizontal joints staggered 24 inches each side and unsupported but finished.
- c. On wood frame floor/ceiling or roof/ceiling assemblies, gypsum board shall be installed with the long dimension perpendicular to framing members and shall have all joints finished.
- d. The membrane on the unexposed side shall not be included in determining the fire resistance of the assembly. Where dissimilar membranes are used on a wall assembly, the calculation shall be made from the least fire-resistant (weaker) side.
- e. The time assigned is not a finished rating.

FIRE AND SMOKE PROTECTION FEATURES

TABLE 722.6.2(2)
TIME ASSIGNED FOR CONTRIBUTION OF WOOD FRAME^{a, b, c}

| DESCRIPTION | TIME ASSIGNED TO FRAME (minutes) |
|---|----------------------------------|
| Wood studs 16 inches o.c. | 20 |
| Wood floor and roof joists 16 inches o.c. | 10 |

For SI: 1 inch = 25.4 mm.

- a. This table does not apply to studs or joists spaced more than 16 inches o.c.
- b. All studs shall be nominal 2 × 4 and all joists shall have a nominal thickness of not less than 2 inches.
- c. Allowable spans for joists shall be determined in accordance with Sections 2308.4.2.1, 2308.7.1 and 2308.7.2.

TABLE 722.6.2(3)
MEMBRANE^a ON EXTERIOR FACE OF WOOD STUD WALLS

| SHEATHING | PAPER | EXTERIOR FINISH |
|--|-----------------|---|
| $\frac{5}{8}$ -inch T & G lumber $\frac{5}{16}$ -inch exterior glue wood structural panel $\frac{1}{2}$ -inch gypsum wallboard $\frac{5}{8}$ -inch gypsum wallboard $\frac{1}{2}$ -inch fiberboard | Sheathing paper | Lumber siding Wood shingles and shakes $\frac{1}{4}$ -inch fiber-cement lap, panel or shingle siding $\frac{1}{4}$ -inch wood structural panels-exterior type $\frac{1}{4}$ -inch hardboard Metal siding Stucco on metal lath Masonry veneer Vinyl siding |
| None | — | $\frac{3}{8}$ -inch exterior-grade wood structural panels |

For SI: 1 inch = 25.4 mm.

- a. Any combination of sheathing, paper and exterior finish is permitted.

722.6.2.4 Floors and roofs. In the case of a floor or roof, the standard test provides only for testing for fire exposure from below. Except as noted in Section 703.3, Item 5, floor or roof assemblies of wood framing shall have an upper membrane consisting of a subfloor and finished floor conforming to Table 722.6.2(4) or any other membrane that has a contribution to *fire resistance* of not less than 15 minutes in Table 722.6.2(1).

722.6.2.5 Additional protection. Table 722.6.2(5) indicates the time increments to be added to the *fire resistance* where glass fiber, rockwool, slag mineral wool or cellulose insulation is incorporated in the assembly.

722.6.2.6 Fastening. Fastening of wood frame assemblies and the fastening of membranes to the wood framing members shall be done in accordance with Chapter 23.

TABLE 722.6.2(4)
FLOORING OR ROOFING OVER WOOD FRAMING^a

| ASSEMBLY | STRUCTURAL MEMBERS | SUBFLOOR OR ROOF DECK | FINISHED FLOORING OR ROOFING |
|----------|--------------------|--|---|
| Floor | Wood | $\frac{15}{32}$ -inch wood structural panels or $\frac{11}{16}$ -inch T & G softwood | Hardwood or softwood flooring on building paper resilient flooring, parquet floor felted-synthetic fiber floor coverings, carpeting, or ceramic tile on $\frac{1}{4}$ -inch-thick fiber-cement underlayment or $\frac{3}{8}$ -inch-thick panel-type underlay Ceramic tile on $1\frac{1}{4}$ -inch mortar bed |
| Roof | Wood | $\frac{15}{32}$ -inch wood structural panels or $\frac{11}{16}$ -inch T & G softwood | Finished roofing material with or without insulation |

For SI: 1 inch = 25.4 mm.

a. This table applies only to wood joist construction. It is not applicable to wood truss construction.

TABLE 722.6.2(5)
TIME ASSIGNED FOR ADDITIONAL PROTECTION

| DESCRIPTION OF ADDITIONAL PROTECTION | FIRE RESISTANCE (minutes) |
|--|---------------------------|
| Add to the <i>fire-resistance rating</i> of wood stud walls if the spaces between the studs are completely filled with glass fiber mineral wool batts weighing not less than 2 pounds per cubic foot (0.6 pound per square foot of wall surface) or rockwool or slag material wool batts weighing not less than 3.3 pounds per cubic foot (1 pound per square foot of wall surface), or cellulose insulation having a nominal density not less than 2.6 pounds per cubic foot. | 15 |

For SI: 1 pound/cubic foot = 16.0185 kg/m³.

CHAPTER 8

INTERIOR FINISHES

SECTION 801 GENERAL

801.1 Scope. The provisions of this chapter shall govern the use of materials used as *interior finishes, trim and decorative materials*.

801.2 Interior wall and ceiling finish. The provisions of Section 803 shall limit the allowable fire performance and smoke development of *interior wall and ceiling finish* materials based on occupancy classification.

801.3 Interior floor finish. The provisions of Section 804 shall limit the allowable fire performance of *interior floor finish* materials based on occupancy classification.

801.4 Decorative materials and trim. *Decorative materials* and *trim* shall be restricted by combustibility, fire performance or flame propagation performance criteria in accordance with Section 806.

801.5 Applicability. For buildings in flood hazard areas as established in Section 1612.3, *interior finishes, trim and decorative materials* below the elevation required by Section 1612 shall be flood-damage-resistant materials.

801.6 Application. Combustible materials shall be permitted to be used as finish for walls, ceilings, floors and other interior surfaces of buildings.

801.7 Windows. Show windows in the exterior walls of the first story above grade plane shall be permitted to be of wood or of unprotected metal framing.

801.8 Foam plastics. Foam plastics shall not be used as *interior finish* except as provided in Section 803.4. Foam plastics shall not be used as interior *trim* except as provided in Section 806.5 or 2604.2. This section shall apply both to exposed foam plastics and to foam plastics used in conjunction with a textile or vinyl facing or cover.

SECTION 802 DEFINITIONS

802.1 Definitions. The following terms are defined in Chapter 2:

EXPANDED VINYL WALL COVERING.

FLAME SPREAD.

FLAME SPREAD INDEX.

INTERIOR FINISH.

INTERIOR FLOOR FINISH.

INTERIOR FLOOR-WALL BASE.

INTERIOR WALL AND CEILING FINISH.

SITE-FABRICATED STRETCH SYSTEM.

SMOKE-DEVELOPED INDEX.

TRIM.

SECTION 803 WALL AND CEILING FINISHES

803.1 General. *Interior wall and ceiling finish* materials shall be classified for fire performance and smoke development in accordance with Section 803.1.1 or 803.1.2, except as shown in Sections 803.2 through 803.13. Materials tested in accordance with Section 803.1.2 shall not be required to be tested in accordance with Section 803.1.1.

803.1.1 Interior wall and ceiling finish materials. Interior wall and ceiling finish materials shall be classified in accordance with ASTM E84 or UL 723. Such *interior finish* materials shall be grouped in the following classes in accordance with their flame spread and *smoke-developed indexes*.

Class A: = Flame spread index 0-25; smoke-developed index 0-450.

Class B: = Flame spread index 26-75; smoke-developed index 0-450.

Class C: = Flame spread index 76-200; smoke-developed index 0-450.

Exception: Materials tested in accordance with Section 803.1.2.

803.1.2 Room corner test for interior wall or ceiling finish materials. *Interior wall or ceiling finish* materials shall be permitted to be tested in accordance with NFPA 286. Interior wall or ceiling finish materials tested in accordance with NFPA 286 shall comply with Section 803.1.2.1.

803.1.2.1 Acceptance criteria for NFPA 286. The interior finish shall comply with the following:

1. During the 40 kW exposure, flames shall not spread to the ceiling.
2. The flame shall not spread to the outer extremity of the sample on any wall or ceiling.
3. Flashover, as defined in NFPA 286, shall not occur.
4. The peak heat release rate throughout the test shall not exceed 800 kW.
5. The total smoke released throughout the test shall not exceed 1,000 m².

803.1.3 Room corner test for textile wall coverings and expanded vinyl wall coverings. Textile wall coverings and expanded vinyl wall coverings shall meet the criteria of Section 803.1.3.1 when tested in the manner intended for use in accordance with the Method B protocol of NFPA 265 using the product-mounting system, including adhesive.

803.1.3.1 Acceptance criteria for NFPA 265. The interior finish shall comply with the following:

1. During the 40 kW exposure, flames shall not spread to the ceiling.
2. The flame shall not spread to the outer extremities of the samples on the 8-foot by 12-foot (203 by 305 mm) walls.
3. Flashover, as defined in NFPA 265, shall not occur.
4. The total smoke released throughout the test shall not exceed 1,000 m².

803.1.4 Acceptance criteria for textile and expanded vinyl wall or ceiling coverings tested to ASTM E84 or UL 723. Textile wall and ceiling coverings and expanded vinyl wall and ceiling coverings shall have a Class A flame spread index in accordance with ASTM E84 or UL 723 and be protected by an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2. Test specimen preparation and mounting shall be in accordance with ASTM E2404.

803.2 Thickness exemption. Materials having a thickness less than 0.036 inch (0.9 mm) applied directly to the surface of walls or ceilings shall not be required to be tested.

803.3 Heavy timber exemption. Exposed portions of building elements complying with the requirements for buildings of Type IV construction in Section 602.4 shall not be subject to *interior finish* requirements.

803.4 Foam plastics. Foam plastics shall not be used as *interior finish* except as provided in Section 2603.9. This section shall apply both to exposed foam plastics and to foam plastics used in conjunction with a textile or vinyl facing or cover.

803.5 Textile wall coverings. Where used as interior wall finish materials, textile wall coverings, including materials having woven or nonwoven, napped, tufted, looped or similar surface and carpet and similar textile materials, shall be tested in the manner intended for use, using the product mounting system, including adhesive, and shall comply with the requirements of Section 803.1.2, 803.1.3 or 803.1.4.

803.6 Textile ceiling coverings. Where used as interior ceiling finish materials, textile ceiling coverings, including materials having woven or nonwoven, napped, tufted, looped or similar surface and carpet and similar textile materials, shall be tested in the manner intended for use, using the product mounting system, including adhesive, and shall comply with the requirements of Section 803.1.2 or 803.1.4.

803.7 Expanded vinyl wall coverings. Where used as interior wall finish materials, expanded vinyl wall coverings shall be tested in the manner intended for use, using the product mounting system, including adhesive, and shall comply with the requirements of Section 803.1.2, 803.1.3 or 803.1.4.

803.8 Expanded vinyl ceiling coverings. Where used as interior ceiling finish materials, expanded vinyl ceiling coverings shall be tested in the manner intended for use, using the

product mounting system, including adhesive, and shall comply with the requirements of Section 803.1.2 or 803.1.4.

803.9 High-density polyethylene (HDPE) and polypropylene (PP). Where high-density polyethylene or polypropylene is used as an interior finish it shall comply with Section 803.1.2.

803.10 Site-fabricated stretch systems. Where used as interior wall or interior ceiling finish materials, site-fabricated stretch systems containing all three components described in the definition in Chapter 2 shall be tested in the manner intended for use, and shall comply with the requirements of Section 803.1.1 or 803.1.2. If the materials are tested in accordance with ASTM E84 or UL 723, specimen preparation and mounting shall be in accordance with ASTM E2573.

803.11 Interior finish requirements based on group. *Interior wall and ceiling finish* shall have a flame spread index not greater than that specified in Table 803.11 for the group and location designated. *Interior wall and ceiling finish* materials tested in accordance with NFPA 286 and meeting the acceptance criteria of Section 803.1.2.1, shall be permitted to be used where a Class A classification in accordance with ASTM E84 or UL 723 is required.

803.12 Stability. *Interior finish* materials regulated by this chapter shall be applied or otherwise fastened in such a manner that such materials will not readily become detached where subjected to room temperatures of 200°F (93°C) for not less than 30 minutes.

803.13 Application of interior finish materials to fire-resistance-rated or noncombustible building elements. Where *interior finish* materials are applied on walls, ceilings or structural elements required to have a *fire-resistance rating* or to be of noncombustible construction, these finish materials shall comply with the provisions of this section.

803.13.1 Direct attachment and furred construction. Where walls and ceilings are required by any provision in this code to be of fire-resistance-rated or noncombustible construction, the *interior finish* material shall be applied directly against such construction or to furring strips not exceeding 1³/₄ inches (44 mm), applied directly against such surfaces.

803.13.1.1 Furred construction. If the interior finish material is applied to furring strips, the intervening spaces between such furring strips shall comply with one of the following:

1. Be filled with material that is inorganic or noncombustible;
2. Be filled with material that meets the requirements of a Class A material in accordance with Section 803.1.1 or 803.1.2; or
3. Be fireblocked at a maximum of 8 feet (2438 mm) in every direction in accordance with Section 718.

803.13.2 Set-out construction. Where walls and ceilings are required to be of fire-resistance-rated or noncombustible construction and walls are set out or ceilings are

TABLE 803.11
INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY^k

| GROUP | SPRINKLERED ^l | | | NONSPRINKLERED | | |
|-----------------------------|--|---|--|--|---|--|
| | Interior exit stairways and ramps and exit passageways ^{a, b} | Corridors and enclosure for exit access stairways and ramps | Rooms and enclosed spaces ^c | Interior exit stairways and ramps and exit passageways ^{a, b} | Corridors and enclosure for exit access stairways and ramps | Rooms and enclosed spaces ^c |
| A-1 & A-2 | B | B | C | A | A ^d | B ^e |
| A-3 ^f , A-4, A-5 | B | B | C | A | A ^d | C |
| B, E, M, R-1 | B | C | C | A | B | C |
| R-4 | B | C | C | A | B | B |
| F | C | C | C | B | C | C |
| H | B | B | C ^g | A | A | B |
| I-1 | B | C | C | A | B | B |
| I-2 | B | B | B ^{h, i} | A | A | B |
| I-3 | A | A ⁱ | C | A | A | B |
| I-4 | B | B | B ^{h, i} | A | A | B |
| R-2 | C | C | C | B | B | C |
| R-3 | C | C | C | C | C | C |
| S | C | C | C | B | B | C |
| U | No restrictions | | | No restrictions | | |

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929m².

- Class C interior finish materials shall be permitted for wainscoting or paneling of not more than 1,000 square feet of applied surface area in the grade lobby where applied directly to a noncombustible base or over furring strips applied to a noncombustible base and fireblocked as required by Section 803.13.1.
- In other than Group I-3 occupancies in buildings less than three stories above grade plane, Class B interior finish for nonsprinklered buildings and Class C interior finish for sprinklered buildings shall be permitted in interior exit stairways and ramps.
- Requirements for rooms and enclosed spaces shall be based upon spaces enclosed by partitions. Where a fire-resistance rating is required for structural elements, the enclosing partitions shall extend from the floor to the ceiling. Partitions that do not comply with this shall be considered enclosing spaces and the rooms or spaces on both sides shall be considered one. In determining the applicable requirements for rooms and enclosed spaces, the specific occupancy thereof shall be the governing factor regardless of the group classification of the building or structure.
- Lobby areas in Group A-1, A-2 and A-3 occupancies shall not be less than Class B materials.
- Class C interior finish materials shall be permitted in places of assembly with an occupant load of 300 persons or less.
- For places of religious worship, wood used for ornamental purposes, trusses, paneling or chancel furnishing shall be permitted.
- Class B material is required where the building exceeds two stories.
- Class C interior finish materials shall be permitted in administrative spaces.
- Class C interior finish materials shall be permitted in rooms with a capacity of four persons or less.
- Class B materials shall be permitted as wainscoting extending not more than 48 inches above the finished floor in corridors and exit access stairways and ramps.
- Finish materials as provided for in other sections of this code.
- Applies when protected by an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.

dropped distances greater than specified in Section 803.13.1, Class A finish materials, in accordance with Section 803.1.1 or 803.1.2, shall be used.

Exceptions:

- Where *interior finish* materials are protected on both sides by an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.
- Where *interior finish* materials are attached to noncombustible backing or furring strips installed as specified in Section 803.13.1.1.

803.13.2.1 Hangers and assembly members. The hangers and assembly members of such dropped ceilings that are below the horizontal fire-resistance-rated floor or roof assemblies shall be of noncombustible materials. The construction of each set-out wall and

horizontal fire-resistance-rated floor or roof assembly shall be of fire-resistance-rated construction as required elsewhere in this code.

Exception: In Type III and V construction, *fire-retardant-treated wood* shall be permitted for use as hangers and assembly members of dropped ceilings.

803.13.3 Heavy timber construction. Wall and ceiling finishes of all classes as permitted in this chapter that are installed directly against the wood decking or planking of Type IV construction or to wood furring strips applied directly to the wood decking or planking shall be fire-blocked as specified in Section 803.13.1.1.

803.13.4 Materials. An interior wall or ceiling finish material that is not more than 1/4 inch (6.4 mm) thick shall be applied directly onto the wall, ceiling or structural element without the use of furring strips and shall not be sus-

pendent away from the building element to which that finish material it is applied.

Exceptions:

1. Noncombustible interior finish materials.
2. Materials that meet the requirements of Class A materials in accordance with Section 803.1.1 or 803.1.2 where the qualifying tests were made with the material furred out from the noncombustible backing shall be permitted to be used with furring strips.
3. Materials that meet the requirements of Class A materials in accordance with Section 803.1.1 or 803.1.2 where the qualifying tests were made with the material suspended away from the noncombustible backing shall be permitted to be used suspended away from the building element.

**SECTION 804
INTERIOR FLOOR FINISH**

804.1 General. *Interior floor finish* and floor covering materials shall comply with Sections 804.2 through 804.4.2.

Exception: Floor finishes and coverings of a traditional type, such as wood, vinyl, linoleum or terrazzo, and resilient floor covering materials that are not comprised of fibers.

804.2 Classification. *Interior floor finish* and floor covering materials required by Section 804.4.2 to be of Class I or II materials shall be classified in accordance with NFPA 253. The classification referred to herein corresponds to the classifications determined by NFPA 253 as follows: Class I, 0.45 watts/cm² or greater; Class II, 0.22 watts/cm² or greater.

804.3 Testing and identification. *Interior floor finish* and floor covering materials shall be tested by an agency in accordance with NFPA 253 and identified by a hang tag or other suitable method so as to identify the manufacturer or supplier and style, and shall indicate the *interior floor finish* or floor covering classification in accordance with Section 804.2. Carpet-type floor coverings shall be tested as proposed for use, including underlayment. Test reports confirming the information provided in the manufacturer's product identification shall be furnished to the building official upon request.

804.4 Interior floor finish requirements. Interior floor covering materials shall comply with Sections 804.4.1 and 804.4.2 and interior floor finish materials shall comply with Section 804.4.2.

804.4.1 Test requirement. In all occupancies, interior floor covering materials shall comply with the requirements of the DOC FF-1 "pill test" (CPSC 16 CFR Part 1630) or with ASTM D2859.

804.4.2 Minimum critical radiant flux. In all occupancies, interior floor finish and floor covering materials in enclosures for stairways and ramps, exit passageways, corridors and rooms or spaces not separated from corridors by partitions extending from the floor to the underside of the ceiling shall withstand a minimum critical radiant flux.

The minimum critical radiant flux shall be not less than Class I in Groups I-1, I-2 and I-3 and not less than Class II in Groups A, B, E, H, I-4, M, R-1, R-2 and S.

Exception: Where a building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2, Class II materials are permitted in any area where Class I materials are required, and materials complying with DOC FF-1 "pill test" (CPSC 16 CFR Part 1630) or with ASTM D2859 are permitted in any area where Class II materials are required.

**SECTION 805
COMBUSTIBLE MATERIALS IN
TYPES I AND II CONSTRUCTION**

805.1 Application. Combustible materials installed on or embedded in floors of buildings of Type I or II construction shall comply with Sections 805.1.1 through 805.1.3.

Exception: Stages and platforms constructed in accordance with Sections 410.3 and 410.4, respectively.

805.1.1 Subfloor construction. Floor sleepers, bucks and nailing blocks shall not be constructed of combustible materials, unless the space between the fire-resistance-rated floor assembly and the flooring is either solidly filled with noncombustible materials or fireblocked in accordance with Section 718, and provided that such open spaces shall not extend under or through permanent partitions or walls.

805.1.2 Wood finish flooring. Wood finish flooring is permitted to be attached directly to the embedded or fireblocked wood sleepers and shall be permitted where cemented directly to the top surface of fire-resistance-rated floor assemblies or directly to a wood subfloor attached to sleepers as provided for in Section 805.1.1.

805.1.3 Insulating boards. Combustible insulating boards not more than 1/2 inch (12.7 mm) thick and covered with finish flooring are permitted where attached directly to a noncombustible floor assembly or to wood subflooring attached to sleepers as provided for in Section 805.1.1.

**SECTION 806
DECORATIVE MATERIALS AND TRIM**

806.1 General. Combustible decorative materials, other than decorative vegetation, shall comply with Sections 806.2 through 806.8.

806.2 Noncombustible materials. The permissible amount of noncombustible materials shall not be limited.

806.3 Combustible decorative materials. In other than Group I-3, curtains, draperies, fabric hangings and similar combustible decorative materials suspended from walls or ceilings shall comply with Section 806.4 and shall not exceed 10 percent of the specific wall or ceiling area to which such materials are attached.

Fixed or movable walls and partitions, paneling, wall pads and crash pads applied structurally or for decoration, acousti-

cal correction, surface insulation or other purposes shall be considered *interior finish* shall comply with Section 803 and shall not be considered *decorative materials* or furnishings.

Exceptions:

1. In auditoriums in Group A, the permissible amount of curtains, draperies, fabric hangings and similar combustible decorative materials suspended from walls or ceilings shall not exceed 75 percent of the aggregate wall area where the building is equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1, and where the material is installed in accordance with Section 803.13 of this code.
2. In Group R-2 dormitories, within sleeping units and dwelling units, the permissible amount of curtains, draperies, fabric hangings and similar decorative materials suspended from walls or ceiling shall not exceed 50 percent of the aggregate wall areas where the building is equipped throughout with an *approved automatic sprinkler system* installed in accordance with Section 903.3.1.
3. In Group B and M occupancies, the amount of combustible fabric partitions suspended from the ceiling and not supported by the floor shall comply with Section 806.4 and shall not be limited.

806.4 Acceptance criteria and reports. Where required to exhibit improved fire performance, curtains, draperies, fabric hangings and similar combustible decorative materials suspended from walls or ceilings shall be tested by an *approved agency* and meet the flame propagation performance criteria of Test 1 or 2, as appropriate, of NFPA 701, or exhibit a maximum heat release rate of 100 kW when tested in accordance with NFPA 289, using the 20 kW ignition source. Reports of test results shall be prepared in accordance with the test method used and furnished to the *building official* upon request.

806.5 Foam plastic. Foam plastic used as *trim* in any occupancy shall comply with Section 2604.2.

806.6 Pyroxylin plastic. Imitation leather or other material consisting of or coated with a pyroxylin or similarly hazardous base shall not be used in Group A occupancies.

806.7 Interior trim. Material, other than foam plastic used as interior *trim*, shall have a minimum Class C flame spread and smoke-developed index when tested in accordance with ASTM E84 or UL 723, as described in Section 803.1.1. Combustible *trim*, excluding handrails and guardrails, shall not exceed 10 percent of the specific wall or ceiling area to which it is attached.

806.8 Interior floor-wall base. *Interior floor-wall base* that is 6 inches (152 mm) or less in height shall be tested in accordance with Section 804.2 and shall be not less than Class II. Where a Class I floor finish is required, the floor-wall base shall be Class I.

Exception: Interior *trim* materials that comply with Section 806.7.

SECTION 807 INSULATION

807.1 Insulation. Thermal and acoustical insulation shall comply with Section 720.

SECTION 808 ACOUSTICAL CEILING SYSTEMS

808.1 Acoustical ceiling systems. The quality, design, fabrication and erection of metal suspension systems for acoustical tile and lay-in panel ceilings in buildings or structures shall conform to generally accepted engineering practice, the provisions of this chapter and other applicable requirements of this code.

808.1.1 Materials and installation. Acoustical materials complying with the *interior finish* requirements of Section 803 shall be installed in accordance with the manufacturer's recommendations and applicable provisions for applying *interior finish*.

808.1.1.1 Suspended acoustical ceilings. Suspended acoustical ceiling systems shall be installed in accordance with the provisions of ASTM C635 and ASTM C636.

808.1.1.2 Fire-resistance-rated construction. Acoustical ceiling systems that are part of fire-resistance-rated construction shall be installed in the same manner used in the assembly tested and shall comply with the provisions of Chapter 7.

CHAPTER 9

FIRE PROTECTION SYSTEMS

SECTION 901 GENERAL

901.1 Scope. The provisions of this chapter shall specify where *fire protection systems* are required and shall apply to the design, installation and operation of *fire protection systems*.

901.2 Fire protection systems. *Fire protection systems* shall be installed, repaired, operated and maintained in accordance with this code and the *Fire Code*.

Any *fire protection system* for which an exception or reduction to the provisions of this code has been granted shall be considered to be a required system.

Exception: Any *fire protection system* or portion thereof not required by this code shall be permitted to be installed for partial or complete protection provided that such system meets the requirements of this code.

901.3 Modifications. Persons shall not remove or modify any *fire protection system* installed or maintained under the provisions of this code or the *Fire Code* without approval by the *building official*.

901.4 Threads. Threads provided for fire department connections to sprinkler systems, standpipes, yard hydrants or any other fire hose connection shall be compatible with the connections used by the local fire department.

901.5 Acceptance tests. *Fire protection systems* shall be tested in accordance with the requirements of this code and the *Fire Code*. When required, the tests shall be conducted in the presence of the *building official*. Tests required by this code, the *Fire Code* and the standards listed in this code shall be conducted at the expense of the owner or the owner's authorized agent. It shall be unlawful to occupy portions of a structure until the required *fire protection systems* within that portion of the structure have been tested and *approved*.

901.6 Supervisory service. Where required, *fire protection systems* shall be monitored by an approved supervising station in accordance with NFPA 72.

901.6.1 Automatic sprinkler systems. *Automatic sprinkler systems* shall be monitored by an *approved* supervising station.

Exceptions:

1. A supervising station is not required for *automatic sprinkler systems* protecting one- and two-family dwellings.
2. Limited area systems serving fewer than 20 sprinklers.

901.6.2 Fire alarm systems. Fire alarm systems required by the provisions of Section 907.2 of this code and Sections 907.2 and 907.9 of the *Fire Code* shall be monitored

by an *approved* supervising station in accordance with Section 907.6.6.

Exceptions:

1. Single- and multiple-station smoke alarms required by Section 907.2.11.
2. Smoke detectors in Group I-3 occupancies.
3. Supervisory service is not required for *automatic sprinkler systems* in one- and two-family dwellings.

901.6.3 Group H. Supervision and monitoring of emergency alarm, detection and automatic fire-extinguishing systems in Group H occupancies shall be in accordance with the *Fire Code*.

901.7 Fire areas. Where buildings, or portions thereof, are divided into *fire areas* so as not to exceed the limits established for requiring a *fire protection system* in accordance with this chapter, such *fire areas* shall be separated by *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both, having a *fire-resistance rating* of not less than that determined in accordance with Section 707.3.10.

901.8 Pump and riser room size. Where provided, fire pump rooms and *automatic sprinkler system* riser rooms shall be designed with adequate space for all equipment necessary for the installation, as defined by the manufacturer, with sufficient working room around the stationary equipment. Clearances around equipment to elements of permanent construction, including other installed equipment and appliances, shall be sufficient to allow inspection, service, repair or replacement without removing such elements of permanent construction or disabling the function of a required fire-resistance-rated assembly. Fire pump and *automatic sprinkler system* riser rooms shall be provided with a door(s) and unobstructed passageway large enough to allow removal of the largest piece of equipment.

SECTION 902 DEFINITIONS

902.1 Definitions. The following terms are defined in Chapter 2:

ALARM NOTIFICATION APPLIANCE.

ALARM SIGNAL.

ALARM VERIFICATION FEATURE.

ANNUNCIATOR.

AUDIBLE ALARM NOTIFICATION APPLIANCE.

AUTOMATIC.

AUTOMATIC FIRE-EXTINGUISHING SYSTEM.

AUTOMATIC SMOKE DETECTION SYSTEM.
 AUTOMATIC SPRINKLER SYSTEM.
 AUTOMATIC WATER MIST SYSTEM.
 AVERAGE AMBIENT SOUND LEVEL.
 CARBON DIOXIDE EXTINGUISHING SYSTEMS.
 CEILING LIMIT.
 CLEAN AGENT.
 COMMERCIAL MOTOR VEHICLE.
 CONSTANTLY ATTENDED LOCATION.
 DELUGE SYSTEM.
 DETECTOR, HEAT.
 DRY-CHEMICAL EXTINGUISHING AGENT.
 ELECTRICAL CIRCUIT PROTECTIVE SYSTEM.
 ELEVATOR GROUP.
 EMERGENCY ALARM SYSTEM.
 EMERGENCY VOICE/ALARM COMMUNICATIONS.
 FIRE ALARM BOX, MANUAL.
 FIRE ALARM CONTROL UNIT.
 FIRE ALARM SIGNAL.
 FIRE ALARM SYSTEM.
 FIRE AREA.
 FIRE COMMAND CENTER.
 FIRE DETECTOR, AUTOMATIC.
 FIRE PROTECTION SYSTEM.
 FIRE SAFETY FUNCTIONS.
 FOAM-EXTINGUISHING SYSTEM.
 HALOGENATED EXTINGUISHING SYSTEM.
 INITIATING DEVICE.
 MANUAL FIRE ALARM BOX.
 MULTIPLE-STATION ALARM DEVICE.
 MULTIPLE-STATION SMOKE ALARM.
 NOTIFICATION ZONE.
 NUISANCE ALARM.
 PRIVATE GARAGE.
 RECORD DRAWINGS.
 SINGLE-STATION SMOKE ALARM.
 SMOKE ALARM.
 SMOKE DETECTOR.
 SMOKEPROOF ENCLOSURE.
 STANDPIPE SYSTEM, CLASSES OF.
 Class I system.
 Class II system.
 Class III system.

STANDPIPE, TYPES OF.
 Automatic dry.
 Automatic wet.
 Manual dry.
 Manual wet.
 Semiautomatic dry.
 SUPERVISING STATION.
 SUPERVISORY SERVICE.
 SUPERVISORY SIGNAL.
 SUPERVISORY SIGNAL-INITIATING DEVICE.
 TIRES, BULK STORAGE OF.
 TROUBLE SIGNAL.
 VISIBLE ALARM NOTIFICATION APPLIANCE.
 WET CHEMICAL EXTINGUISHING SYSTEM.
 WIRELESS PROTECTION SYSTEM.
 ZONE.
 ZONE, NOTIFICATION.

SECTION 903 AUTOMATIC SPRINKLER SYSTEMS

903.1 General. *Automatic sprinkler systems* shall comply with this section.

903.1.1 Alternative protection. *Alternative automatic fire-extinguishing systems* complying with Section 904 shall be permitted instead of automatic sprinkler protection where recognized by the applicable standard and approved by the *fire code* official.

903.2 Where required. Approved *automatic sprinkler systems* in new buildings and structures shall be provided in the locations described in Sections 903.2.1 through 903.2.12.

Exception: Spaces or areas in telecommunications buildings used exclusively for telecommunications equipment, associated electrical power distribution equipment, batteries and standby engines, provided those spaces or areas are equipped throughout with an *automatic smoke detection system* in accordance with Section 907.2 and are separated from the remainder of the building by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or not less than 2-hour *horizontal assemblies* constructed in accordance with Section 711, or both.

903.2.1 Group A. An *automatic sprinkler system* shall be provided throughout buildings and portions thereof used as Group A occupancies as provided in this section. For Group A-1, A-2, A-3 and A-4 occupancies, the *automatic sprinkler system* shall be provided throughout the story where the *fire area* containing the Group A-1, A-2, A-3 or A-4 occupancy is located, and throughout all stories from the Group A occupancy to, and including, the *levels of exit discharge* serving the Group A occupancy. For Group A-5 occupancies, the *automatic sprinkler system* shall be provided in the spaces indicated in Section 903.2.1.5.

903.2.1.1 Group A-1. An *automatic sprinkler system* shall be provided for *fire areas* containing Group A-1 occupancies and intervening floors of the building where one of the following conditions exists:

1. The *fire area* exceeds 12,000 square feet (1115 m²).
2. The *fire area* has an *occupant load* of 300 or more.
3. The *fire area* is located on a floor other than a *level of exit discharge* serving such occupancies.
4. The *fire area* contains a multitheater complex.

903.2.1.2 Group A-2. An *automatic sprinkler system* shall be provided for *fire areas* containing Group A-2 occupancies and intervening floors of the building where one of the following conditions exists:

1. The *fire area* exceeds 5,000 square feet (464.5 m²).
2. The *fire area* has an *occupant load* of 100 or more.
3. The *fire area* is located on a floor other than a *level of exit discharge* serving such occupancies.

903.2.1.3 Group A-3. An *automatic sprinkler system* shall be provided for *fire areas* containing Group A-3 occupancies and intervening floors of the building where one of the following conditions exists:

1. The *fire area* exceeds 12,000 square feet (1115 m²).
2. The *fire area* has an *occupant load* of 300 or more.
3. The *fire area* is located on a floor other than a *level of exit discharge* serving such occupancies.

903.2.1.4 Group A-4. An *automatic sprinkler system* shall be provided for *fire areas* containing Group A-4 occupancies and intervening floors of the building where one of the following conditions exists:

1. The *fire area* exceeds 12,000 square feet (1115 m²).
2. The *fire area* has an *occupant load* of 300 or more.
3. The *fire area* is located on a floor other than a *level of exit discharge* serving such occupancies.

903.2.1.5 Group A-5. An *automatic sprinkler system* shall be provided for Group A-5 occupancies in the following areas: concession stands, retail areas, press boxes and other accessory use areas in excess of 1,000 square feet (93 m²).

903.2.1.6 Assembly occupancies on roofs. Where an occupied roof has an assembly occupancy with an *occupant load* exceeding 100 for Group A-2 and 300 for other Group A occupancies, all floors between the occupied roof and the *level of exit discharge* shall be

equipped with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.

Exception: Open parking garages of Type I or Type II construction.

903.2.1.7 Multiple fire areas. An *automatic sprinkler system* shall be provided where multiple fire areas of Group A-1, A-2, A-3 or A-4 occupancies share exit or exit access components and the combined *occupant load* of these fire areas is 300 or more.

903.2.2 Ambulatory care facilities. An *automatic sprinkler system* shall be installed throughout the entire floor containing an *ambulatory care facility* where either of the following conditions exist at any time:

1. Four or more care recipients are incapable of self-preservation, whether rendered incapable by staff or staff has accepted responsibility for care recipients already incapable.
2. One or more care recipients that are incapable of self-preservation are located at other than the level of exit discharge serving such a facility.

In buildings where ambulatory care is provided on levels other than the *level of exit discharge*, an *automatic sprinkler system* shall be installed throughout the entire floor where such care is provided as well as all floors below, and all floors between the level of ambulatory care and the nearest *level of exit discharge*, including the *level of exit discharge*.

903.2.3 Group E. An *automatic sprinkler system* shall be provided for Group E occupancies as follows:

1. Throughout all Group E *fire areas* greater than 12,000 square feet (1115 m²) in area.
2. Throughout every portion of educational buildings below the lowest *level of exit discharge* serving that portion of the building.

Exception: An *automatic sprinkler system* is not required in any area below the lowest *level of exit discharge* serving that area where every classroom throughout the building has not fewer than one exterior exit door at ground level.

903.2.4 Group F-1. An *automatic sprinkler system* shall be provided throughout all buildings containing a Group F-1 occupancy where one of the following conditions exists:

1. A Group F-1 *fire area* exceeds 12,000 square feet (1115 m²).
2. A Group F-1 *fire area* is located more than three stories above *grade plane*.
3. The combined area of all Group F-1 *fire areas* on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m²).
4. A Group F-1 occupancy used for the manufacture of upholstered furniture or mattresses exceeds 2,500 square feet (232 m²).

903.2.4.1 Woodworking operations. An *automatic sprinkler system* shall be provided throughout all Group F-1 occupancy *fire areas* that contain woodworking operations in excess of 2,500 square feet (232 m²) in area that generate finely divided combustible waste or use finely divided combustible materials.

903.2.5 Group H. *Automatic sprinkler systems* shall be provided in high-hazard occupancies as required in Sections 903.2.5.1 through 903.2.5.3.

903.2.5.1 General. An *automatic sprinkler system* shall be installed in Group H occupancies.

903.2.5.2 Group H-5 occupancies. An *automatic sprinkler system* shall be installed throughout buildings containing Group H-5 occupancies. The design of the sprinkler system shall be not less than that required by this code for the occupancy hazard classifications in accordance with Table 903.2.5.2.

Where the design area of the sprinkler system consists of a *corridor* protected by one row of sprinklers, the maximum number of sprinklers required to be calculated is 13.

903.2.5.3 Pyroxylin plastics. An *automatic sprinkler system* shall be provided in buildings, or portions thereof, where cellulose nitrate film or pyroxylin plastics are manufactured, stored or handled in quantities exceeding 100 pounds (45 kg).

**TABLE 903.2.5.2
GROUP H-5 SPRINKLER DESIGN CRITERIA**

| LOCATION | OCCUPANCY HAZARD CLASSIFICATION |
|----------------------------------|---------------------------------|
| Fabrication areas | Ordinary Hazard Group 2 |
| Service corridors | Ordinary Hazard Group 2 |
| Storage rooms without dispensing | Ordinary Hazard Group 2 |
| Storage rooms with dispensing | Extra Hazard Group 2 |
| Corridors | Ordinary Hazard Group 2 |

903.2.6 Group I. An *automatic sprinkler system* shall be provided throughout buildings with a Group I *fire area*.

Exceptions:

1. An *automatic sprinkler system* installed in accordance with Section 903.3.1.2 shall be permitted in Group I-1 Condition 1 facilities.
2. An *automatic sprinkler system* is not required where Group I-4 day care facilities are at the *level of exit discharge* and where every room where care is provided has not fewer than one exterior exit door.
3. In buildings where Group I-4 day care is provided on levels other than the *level of exit discharge*, an *automatic sprinkler system* in accordance with Section 903.3.1.1 shall be installed on the entire floor where care is provided, all floors between the level of care and the level of *exit discharge*, and all floors below the *level of exit discharge* other than areas classified as an open parking garage.

903.2.7 Group M. An *automatic sprinkler system* shall be provided throughout buildings containing a Group M occupancy where one of the following conditions exists:

1. A Group M *fire area* exceeds 12,000 square feet (1115 m²).
2. A Group M *fire area* is located more than three stories above *grade plane*.
3. The combined area of all Group M *fire areas* on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m²).
4. A Group M occupancy used for the display and sale of upholstered furniture or mattresses exceeds 5,000 square feet (464 m²).

903.2.7.1 High-piled storage. An *automatic sprinkler system* shall be provided in accordance with the *Fire Code* in all buildings of Group M where storage of merchandise is in high-piled or rack storage arrays.

903.2.8 Group R. An *automatic sprinkler system* installed in accordance with Section 903.3 shall be provided throughout all buildings with a Group R *fire area*.

903.2.8.1 Group R-3. An *automatic sprinkler system* installed in accordance with Section 903.3.1.3 shall be permitted in Group R-3 occupancies.

903.2.8.2 Group R-4 Condition 1. An *automatic sprinkler system* installed in accordance with Section 903.3.1.3 shall be permitted in Group R-4 Condition 1 occupancies.

903.2.8.3 Group R-4 Condition 2. An *automatic sprinkler system* installed in accordance with Section 903.3.1.2 shall be permitted in Group R-4 Condition 2 occupancies. Attics shall be protected in accordance with Section 903.2.8.3.1 or 903.2.8.3.2.

903.2.8.3.1 Attics used for living purposes, storage or fuel-fired equipment. Attics used for living purposes, storage or fuel-fired equipment shall be protected throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.2.

903.2.8.3.2 Attics not used for living purposes, storage or fuel-fired equipment. Attics not used for living purposes, storage or fuel-fired equipment shall be protected in accordance with one of the following:

1. Attics protected throughout by a heat detector system arranged to activate the building fire alarm system in accordance with Section 907.2.10.
2. Attics constructed of noncombustible materials.
3. Attics constructed of fire-retardant-treated wood framing complying with Section 2303.2.
4. The *automatic sprinkler system* shall be extended to provide protection throughout the attic space.

903.2.8.4 Care facilities. An *automatic sprinkler system* installed in accordance with Section 903.3.1.3 shall

be permitted in care facilities with five or fewer individuals in a single-family dwelling.

903.2.9 Group S-1. An *automatic sprinkler system* shall be provided throughout all buildings containing a Group S-1 occupancy where one of the following conditions exists:

1. A Group S-1 *fire area* exceeds 12,000 square feet (1115 m²).
2. A Group S-1 *fire area* is located more than three stories above *grade plane*.
3. The combined area of all Group S-1 *fire areas* on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m²).
4. A Group S-1 *fire area* used for the storage of commercial motor vehicles where the *fire area* exceeds 5,000 square feet (464 m²).
5. A Group S-1 occupancy used for the storage of upholstered furniture or mattresses exceeds 2,500 square feet (232 m²).

903.2.9.1 Repair garages. An *automatic sprinkler system* shall be provided throughout all buildings used as repair garages in accordance with Section 406, as shown:

1. Buildings having two or more *stories above grade plane*, including basements, with a *fire area* containing a repair garage exceeding 10,000 square feet (929 m²).
2. Buildings not more than one *story above grade plane*, with a *fire area* containing a repair garage exceeding 12,000 square feet (1115 m²).
3. Buildings with repair garages servicing vehicles parked in basements.
4. A Group S-1 *fire area* used for the repair of commercial motor vehicles where the *fire area* exceeds 5,000 square feet (464 m²).

903.2.9.2 Bulk storage of tires. Buildings and structures where the area for the storage of tires exceeds 20,000 cubic feet (566 m³) shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

903.2.10 Group S-2 enclosed parking garages. An *automatic sprinkler system* shall be provided throughout buildings classified as enclosed parking garages in accordance with Section 406.6 where either of the following conditions exists:

1. Where the *fire area* of the enclosed parking garage exceeds 12,000 square feet (1115 m²).
2. Where the enclosed parking garage is located beneath other groups.

Exception: Enclosed parking garages located beneath Group R-3 occupancies.

903.2.10.1 Commercial parking garages. An *automatic sprinkler system* shall be provided throughout buildings used for storage of commercial motor vehi-

cles where the *fire area* exceeds 5,000 square feet (464 m²).

903.2.11 Specific building areas and hazards. In all occupancies other than Group U, an *automatic sprinkler system* shall be installed for building design or hazards in the locations set forth in Sections 903.2.11.1 through 903.2.11.6.

903.2.11.1 Stories without openings. An *automatic sprinkler system* shall be installed throughout all *stories*, including basements, of all buildings where the floor area exceeds 1,500 square feet (139.4 m²) and where there is not provided not fewer than one of the following types of *exterior wall* openings:

1. Openings below grade that lead directly to ground level by an exterior *stairway* complying with Section 1011 or an outside ramp complying with Section 1012. Openings shall be located in each 50 linear feet (15 240 mm), or fraction thereof, of *exterior wall* in the *story* on at least one side. The required openings shall be distributed such that the lineal distance between adjacent openings does not exceed 50 feet (15 240 mm).
2. Openings entirely above the adjoining ground level totaling not less than 20 square feet (1.86 m²) in each 50 linear feet (15 240 mm), or fraction thereof, of *exterior wall* in the *story* on at least one side. The required openings shall be distributed such that the lineal distance between adjacent openings does not exceed 50 feet (15 240 mm). The height of the bottom of the clear opening shall not exceed 44 inches (1118 mm) measured from the floor.

903.2.11.1.1 Opening dimensions and access. Openings shall have a minimum dimension of not less than 30 inches (762 mm). Such openings shall be accessible to the fire department from the exterior and shall not be obstructed in a manner such that fire fighting or rescue cannot be accomplished from the exterior.

903.2.11.1.2 Openings on one side only. Where openings in a *story* are provided on only one side and the opposite wall of such *story* is more than 75 feet (22 860 mm) from such openings, the *story* shall be equipped throughout with an *approved automatic sprinkler system*, or openings as specified above shall be provided on not fewer than two sides of the *story*.

903.2.11.1.3 Basements. Where any portion of a *basement* is located more than 75 feet (22 860 mm) from openings required by Section 903.2.11.1, or where walls, partitions or other obstructions are installed that restrict the application of water from hose streams, the *basement* shall be equipped throughout with an *approved automatic sprinkler system*.

903.2.11.2 Rubbish and linen chutes. An *automatic sprinkler system* shall be installed at the top of rubbish and linen chutes and in their terminal rooms. Chutes shall have additional sprinkler heads installed at alternate floors and at the lowest intake. Where a rubbish chute extends through a building more than one floor below the lowest intake, the extension shall have sprinklers installed that are recessed from the drop area of the chute and protected from freezing in accordance with Section 903.3.1.1. Such sprinklers shall be installed at alternate floors, beginning with the second level below the last intake and ending with the floor above the discharge. Chute sprinklers shall be accessible for servicing.

903.2.11.3 Buildings 55 feet or more in height. An *automatic sprinkler system* shall be installed throughout buildings that have one or more stories with an *occupant load* of 30 or more located 55 feet (16 764 mm) or more above the lowest level of fire department vehicle access, measured to the finished floor.

Exceptions:

1. Open parking structures.
2. Occupancies in Group F-2.

903.2.11.4 Ducts conveying hazardous exhausts. Where required by the *Mechanical Code*, automatic sprinklers shall be provided in ducts conveying hazardous exhaust or flammable or combustible materials.

Exception: Ducts where the largest cross-sectional diameter of the duct is less than 10 inches (254 mm).

903.2.11.5 Commercial cooking operations. An *automatic sprinkler system* shall be installed in commercial kitchen exhaust hood and duct systems where an *automatic sprinkler system* is used to comply with Section 904.

903.2.11.6 Other required suppression systems. In addition to the requirements of Section 903.2, the provisions indicated in Table 903.2.11.6 require the installation of a fire suppression system for certain buildings and areas.

903.2.12 During construction. *Automatic sprinkler systems* required during construction, *alteration* and *demolition* operations shall be provided in accordance with Chapter 33 of the *Fire Code*.

903.3 Installation requirements. *Automatic sprinkler systems* shall be designed and installed in accordance with Sections 903.3.1 through 903.3.8.

903.3.1 Standards. Sprinkler systems shall be designed and installed in accordance with Section 903.3.1.1 unless otherwise permitted by Sections 903.3.1.2 and 903.3.1.3 and other chapters of this code, as applicable.

903.3.1.1 NFPA 13 sprinkler systems. Where the provisions of this code require that a building or portion thereof be equipped throughout with an *automatic sprinkler system* in accordance with this section, sprinklers shall be installed throughout in accordance with

**TABLE 903.2.11.6
ADDITIONAL REQUIRED SUPPRESSION SYSTEMS**

| SECTION | SUBJECT |
|-----------------------------|--|
| 402.5, 402.6.2 | Covered and open mall buildings |
| 403.3 | High-rise buildings |
| 404.3 | Atriums |
| 405.3 | Underground structures |
| 407.6 | Group I-2 |
| 410.7 | Stages |
| 411.4 | Special amusement buildings |
| 412.3.6 | Airport traffic control towers |
| 412.4.6, 412.4.6.1, 412.6.5 | Aircraft hangars |
| 415.11.11 | Group H-5 HPM exhaust ducts |
| 416.5 | Flammable finishes |
| 417.4 | Drying rooms |
| 419.5 | <i>Live/work units</i> |
| 424.3 | Children's play structures |
| 507 | Unlimited area buildings |
| 509.4 | Incidental uses |
| 1029.6.2.3 | Smoke-protected assembly seating |
| IFC | Sprinkler system requirements as set forth in Section 903.2.11.6 of the <i>Fire Code</i> |

NFPA 13 except as provided in Sections 903.3.1.1.1 and 903.3.1.1.2.

903.3.1.1.1 Exempt locations. Automatic sprinklers shall not be required in the following rooms or areas where such rooms or areas are protected with an *approved* automatic fire detection system in accordance with Section 907.2 that will respond to visible or invisible particles of combustion. Sprinklers shall not be omitted from a room merely because it is damp, of fire-resistance-rated construction or contains electrical equipment.

1. A room where the application of water, or flame and water, constitutes a serious life or fire hazard.
2. A room or space where sprinklers are considered undesirable because of the nature of the contents, where *approved* by the *fire code* official.
3. Generator and transformer rooms separated from the remainder of the building by walls and floor/ceiling or roof/ceiling assemblies having a *fire-resistance rating* of not less than 2 hours.
4. Rooms or areas that are of noncombustible construction with wholly noncombustible contents.
5. Fire service access elevator machine rooms and machinery spaces.

6. Machine rooms, machinery spaces, control rooms and control spaces associated with occupant evacuation elevators designed in accordance with Section 3008.

903.3.1.1.2 Bathrooms. In Group R occupancies, other than Group R-4 occupancies, sprinklers shall not be required in bathrooms that do not exceed 55 square feet (5 m²) in area and are located within individual *dwelling units* or *sleeping units*, provided that walls and ceilings, including the walls and ceilings behind a shower enclosure or tub, are of noncombustible or limited-combustible materials with a 15-minute thermal barrier rating.

903.3.1.2 NFPA 13R sprinkler systems. *Automatic sprinkler systems* in Group R occupancies up to and including four stories in height in buildings not exceeding 60 feet (18 288 mm) in height above grade plane shall be permitted to be installed throughout in accordance with NFPA 13R.

The number of stories of Group R occupancies constructed in accordance with Sections 510.2 and 510.4 shall be measured from the horizontal assembly creating separate buildings.

903.3.1.2.1 Balconies and decks. Sprinkler protection shall be provided for exterior balconies, decks and ground floor patios of *dwelling units* and *sleeping units* where the building is of Type V construction, provided there is a roof or deck above. Sidewall sprinklers that are used to protect such areas shall be permitted to be located such that their deflectors are within 1 inch (25 mm) to 6 inches (152 mm) below the structural members and a maximum distance of 14 inches (356 mm) below the deck of the exterior balconies and decks that are constructed of open wood joist construction.

903.3.1.2.2 Open-ended corridors. Sprinkler protection shall be provided in *open-ended corridors* and associated *exterior stairways* and *ramps* as specified in Section 1027.6, Exception 3.

903.3.1.2.3 Attics. Attic protection shall be provided as follows:

1. Attics that are used or intended for living purposes or storage shall be protected by an automatic sprinkler system.
 2. Where fuel-fired equipment is installed in an unsprinklered attic, not fewer than one quick-response intermediate temperature sprinkler shall be installed above the equipment.
 3. Where located in a building of Type III, Type IV or Type V construction designed in accordance with Section 510.2 or 510.4, attics not required by Item 1 to have sprinklers shall comply with one of the following if the roof assembly is located more than 55 feet (16 764 mm) above the lowest level of required fire department vehicle access:
 - 3.1. Provide automatic sprinkler system protection.
 - 3.2. Construct the attic using noncombustible materials.
 - 3.3. Construct the attic using fire-retardant-treated wood complying with Section 2303.2 of this code.
 - 3.4. Fill the attic with noncombustible insulation. The height of the roof assembly shall be determined by measuring the distance from the lowest required fire vehicle access road surface adjacent to the building to the eave of the highest pitched roof, the intersection of the highest roof to the exterior wall or the top of the highest parapet, whichever yields the greatest distance. For the purpose of this measurement, required fire vehicle access roads shall include only those roads that are necessary for compliance with Section 503.
4. Group R-4, Condition 2 occupancy attics not required by Item 1 to have sprinklers shall comply with one of the following:
- 4.1. Provide automatic sprinkler system protection.
 - 4.2. Provide a heat detection system throughout the attic that is arranged to activate the building fire alarm system.
 - 4.3. Construct the attic using noncombustible materials.
 - 4.4. Construct the attic using fire-retardant-treated wood complying with Section 2303.2.
 - 4.5. Fill the attic with noncombustible insulation.

903.3.1.3 NFPA 13D sprinkler systems. *Automatic sprinkler systems* installed in one- and two-family dwellings; Group R-3, Group R-4 Condition 1 and townhouses shall be permitted to be installed throughout in accordance with NFPA 13D.

903.3.2 Quick-response and residential sprinklers. Where *automatic sprinkler systems* are required by this code, quick-response or residential automatic sprinklers shall be installed in all of the following areas in accordance with Section 903.3.1 and their listings:

1. Throughout all spaces within a smoke compartment containing care recipient *sleeping units* in Group I-2 in accordance with this code.
2. Throughout all spaces within a smoke compartment containing treatment rooms in ambulatory care facilities.
3. *Dwelling units* and *sleeping units* in Group I-1 and R occupancies.
4. Light-hazard occupancies as defined in NFPA 13.

903.3.3 Obstructed locations. Automatic sprinklers shall be installed with due regard to obstructions that will delay activation or obstruct the water distribution pattern. Automatic sprinklers shall be installed in or under covered kiosks, displays, booths, concession stands, or equipment that exceeds 4 feet (1219 mm) in width. Not less than a 3-foot (914 mm) clearance shall be maintained between automatic sprinklers and the top of piles of combustible fibers.

Exception: Kitchen equipment under exhaust hoods protected with a fire-extinguishing system in accordance with Section 904.

903.3.4 Actuation. *Automatic sprinkler systems* shall be automatically actuated unless specifically provided for in this code.

903.3.5 Water supplies. Water supplies for *automatic sprinkler systems* shall comply with this section and the standards referenced in Section 903.3.1. The potable water supply shall be protected against backflow in accordance with the requirements of this section and the *Plumbing Code*. For connections to public waterworks systems, the water supply test used for design of fire protection systems shall be adjusted to account for seasonal and daily pressure fluctuations based on information from the water supply authority and as approved by the *fire code* official.

903.3.5.1 Domestic services. Where the domestic service provides the water supply for the *automatic sprinkler system*, the supply shall be in accordance with this section.

903.3.5.2 Residential combination services. A single combination water supply shall be allowed provided that the domestic demand is added to the sprinkler demand as required by NFPA 13R.

903.3.6 Hose threads. Fire hose threads and fittings used in connection with *automatic sprinkler systems* shall be as prescribed by the *fire code* official.

903.3.7 Fire department connections. Fire department connections for *automatic sprinkler systems* shall be installed in accordance with Section 912.

903.3.8 Limited area sprinkler systems. Limited area sprinkler systems shall be in accordance with the standards listed in Section 903.3.1 except as provided in Sections 903.3.8.1 through 903.3.8.5.

903.3.8.1 Number of sprinklers. Limited area sprinkler systems shall not exceed six sprinklers in any single *fire area*.

903.3.8.2 Occupancy hazard classification. Only areas classified by NFPA 13 as Light Hazard or Ordinary Hazard Group 1 shall be permitted to be protected by limited area sprinkler systems.

903.3.8.3 Piping arrangement. Where a limited area sprinkler system is installed in a building with an automatic wet standpipe system, sprinklers shall be supplied by the standpipe system. Where a limited area sprinkler system is installed in a building without an automatic wet standpipe system, water shall be permitted

to be supplied by the plumbing system provided that the plumbing system is capable of simultaneously supplying domestic and sprinkler demands.

903.3.8.4 Supervision. Control valves shall not be installed between the water supply and sprinklers unless the valves are of an *approved* indicating type that are supervised or secured in the open position.

903.3.8.5 Calculations. Hydraulic calculations in accordance with NFPA 13 shall be provided to demonstrate that the available water flow and pressure are adequate to supply all sprinklers installed in any single *fire area* with discharge densities corresponding to the hazard classification.

903.4 Sprinkler system supervision and alarms. Valves controlling the water supply for *automatic sprinkler systems*, pumps, tanks, water levels and temperatures, critical air pressures and waterflow switches on all sprinkler systems shall be electrically supervised by a *listed* fire alarm control unit.

Exceptions:

1. *Automatic sprinkler systems* protecting one- and two-family *dwelling*s.
2. Limited area sprinkler systems in accordance with Section 903.3.8.
3. *Automatic sprinkler systems* installed in accordance with NFPA 13R where a common supply main is used to supply both domestic water and the *automatic sprinkler system*, and a separate shutoff valve for the *automatic sprinkler system* is not provided.
4. Jockey pump control valves that are sealed or locked in the open position.
5. Control valves to commercial kitchen hoods, paint spray booths or dip tanks that are sealed or locked in the open position.
6. Valves controlling the fuel supply to fire pump engines that are sealed or locked in the open position.
7. Trim valves to pressure switches in dry, preaction and deluge sprinkler systems that are sealed or locked in the open position.

903.4.1 Monitoring. Alarm, supervisory and trouble signals shall be distinctly different and shall be automatically transmitted to an *approved* supervising station or, where *approved* by the *fire code* official, shall sound an audible signal at a *constantly attended location*.

Exceptions:

1. Underground key or hub valves in roadway boxes provided by the municipality or public utility are not required to be monitored.
2. Backflow prevention device test valves located in limited area sprinkler system supply piping shall be locked in the open position. In occupancies required to be equipped with a fire alarm system, the backflow preventer valves shall be electrically supervised by a tamper switch installed in accordance with NFPA 72 and separately annunciated.

903.4.2 Alarms. An approved audible device, located on the exterior of the building in an *approved* location, shall be connected to each *automatic sprinkler system*. Such sprinkler water-flow alarm devices shall be activated by water flow equivalent to the flow of a single sprinkler of the smallest orifice size installed in the system. Where a fire alarm system is installed, actuation of the *automatic sprinkler system* shall actuate the building fire alarm system.

Exception: An alarm device shall not be required on the exterior of the building when the sprinkler system is monitored by an approved central station, remote supervising station or proprietary supervising station in accordance with NFPA 72.

903.4.3 Floor control valves. *Approved* supervised indicating control valves shall be provided at the point of connection to the riser on each floor in high-rise buildings.

903.4.4 Where a sprinkler system is looped such that more than one control valve must be closed to stop flow from that zone, a sign shall be placed at each control valve indicating the locations of the other control valves for that zone.

903.5 Testing and maintenance. Sprinkler systems shall be tested and maintained in accordance with the *Fire Code*.

SECTION 904 ALTERNATIVE AUTOMATIC FIRE-EXTINGUISHING SYSTEMS

904.1 General. Automatic fire-extinguishing systems, other than *automatic sprinkler systems*, shall be designed, installed, inspected, tested and maintained in accordance with the provisions of this section and the applicable referenced standards.

904.2 Where permitted. Automatic fire-extinguishing systems installed as an alternative to the required *automatic sprinkler systems* of Section 903 shall be *approved* by the *fire code* official.

904.2.1 Restriction on using automatic sprinkler system exceptions or reductions. Automatic fire-extinguishing systems shall not be considered alternatives for the purposes of exceptions or reductions allowed for *automatic sprinkler systems* or by other requirements of this code.

904.2.2 Commercial hood and duct systems. Each required commercial kitchen exhaust hood and duct system required by Section 609 of the *Fire Code* or Chapter 5 of the *Mechanical Code* to have a Type I hood shall be protected with an approved automatic fire-extinguishing system installed in accordance with this code.

904.3 Installation. Automatic fire-extinguishing systems shall be installed in accordance with this section.

904.3.1 Electrical wiring. Electrical wiring shall be in accordance with NFPA 70.

904.3.2 Actuation. Automatic fire-extinguishing systems shall be automatically actuated and provided with a manual means of actuation in accordance with Section

904.11.1. Where more than one hazard could be simultaneously involved in fire due to their proximity, all hazards shall be protected by a single system designed to protect all hazards that could become involved.

Exception: Multiple systems shall be permitted to be installed if they are designed to operate simultaneously.

904.3.3 System interlocking. Automatic equipment interlocks with fuel shutoffs, ventilation controls, door closers, window shutters, conveyor openings, smoke and heat vents and other features necessary for proper operation of the fire-extinguishing system shall be provided as required by the design and installation standard utilized for the hazard.

904.3.4 Alarms and warning signs. Where alarms are required to indicate the operation of automatic fire-extinguishing systems, distinctive audible and visible alarms and warning signs shall be provided to warn of pending agent discharge. Where exposure to automatic-extinguishing agents poses a hazard to persons and a delay is required to ensure the evacuation of occupants before agent discharge, a separate warning signal shall be provided to alert occupants once agent discharge has begun. Audible signals shall be in accordance with Section 907.5.2.

904.3.5 Monitoring. Where a building fire alarm system is installed, automatic fire-extinguishing systems shall be monitored by the building fire alarm system in accordance with NFPA 72.

904.4 Inspection and testing. Automatic fire-extinguishing systems shall be inspected and tested in accordance with the provisions of this section prior to acceptance.

904.4.1 Inspection. Prior to conducting final acceptance tests, all of the following items shall be inspected:

1. Hazard specification for consistency with design hazard.
2. Type, location and spacing of automatic- and manual-initiating devices.
3. Size, placement and position of nozzles or discharge orifices.
4. Location and identification of audible and visible alarm devices.
5. Identification of devices with proper designations.
6. Operating instructions.

904.4.2 Alarm testing. Notification appliances, connections to fire alarm systems and connections to *approved* supervising stations shall be tested in accordance with this section and Section 907 to verify proper operation.

904.4.2.1 Audible and visible signals. The audibility and visibility of notification appliances signaling agent discharge or system operation, where required, shall be verified.

904.4.3 Monitor testing. Connections to protected premises and supervising station fire alarm systems shall be tested to verify proper identification and retransmission of alarms from automatic fire-extinguishing systems.

904.5 Wet-chemical systems. Wet-chemical extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with NFPA 17A and their listing. Records of inspections and testing shall be maintained.

904.6 Dry-chemical systems. Dry-chemical extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with NFPA 17 and their listing. Records of inspections and testing shall be maintained.

904.7 Foam systems. Foam-extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with NFPA 11 and NFPA 16 and their listing. Records of inspections and testing shall be maintained.

904.8 Carbon dioxide systems. Carbon dioxide extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with NFPA 12 and their listing. Records of inspections and testing shall be maintained.

904.9 Halon systems. Halogenated extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with NFPA 12A and their listing. Records of inspections and testing shall be maintained.

904.10 Clean-agent systems. Clean-agent fire-extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with NFPA 2001 and their listing. Records of inspections and testing shall be maintained.

904.11 Automatic water mist systems. *Automatic water mist systems* shall be permitted in applications that are consistent with the applicable listing or approvals and shall comply with Sections 904.11.1 through 904.11.3.

904.11.1 Design and installation requirements. *Automatic water mist systems* shall be designed and installed in accordance with Sections 904.11.1.1 through 904.11.1.4.

904.11.1.1 General. *Automatic water mist systems* shall be designed and installed in accordance with NFPA 750 and the manufacturer's instructions.

904.11.1.2 Actuation. *Automatic water mist systems* shall be automatically actuated.

904.11.1.3 Water supply protection. Connections to a potable water supply shall be protected against backflow in accordance with the *Plumbing Code*.

904.11.1.4 Secondary water supply. Where a secondary water supply is required for an *automatic sprinkler system*, an *automatic water mist system* shall be provided with an *approved* secondary water supply.

904.11.2 Water mist system supervision and alarms. Supervision and alarms shall be provided as required for *automatic sprinkler systems* in accordance with Section 903.4.

904.11.2.1 Monitoring. Monitoring shall be provided as required for *automatic sprinkler systems* in accordance with Section 903.4.1.

904.11.2.2 Alarms. Alarms shall be provided as required for *automatic sprinkler systems* in accordance with Section 903.4.2.

904.11.2.3 Floor control valves. Floor control valves shall be provided as required for *automatic sprinkler systems* in accordance with Section 903.4.3.

904.11.3 Testing and maintenance. *Automatic water mist systems* shall be tested and maintained in accordance with the *Fire Code*.

904.12 Commercial cooking systems. The automatic fire-extinguishing system for commercial cooking systems shall be of a type recognized for protection of commercial cooking equipment and exhaust systems of the type and arrangement protected. Preengineered automatic dry- and wet-chemical extinguishing systems shall be tested in accordance with UL 300 and *listed* and *labeled* for the intended application. Other types of automatic fire-extinguishing systems shall be *listed* and *labeled* for specific use as protection for commercial cooking operations. The system shall be installed in accordance with this code, its listing and the manufacturer's installation instructions. Automatic fire-extinguishing systems of the following types shall be installed in accordance with the referenced standard indicated, as follows:

1. Carbon dioxide extinguishing systems, NFPA 12.
2. *Automatic sprinkler systems*, NFPA 13.
3. Foam-water sprinkler system or foam-water spray systems, NFPA 16.
4. Dry-chemical extinguishing systems, NFPA 17.
5. Wet-chemical extinguishing systems, NFPA 17A.

Exception: Factory-built commercial cooking recirculating systems that are tested in accordance with UL 710B and *listed*, *labeled* and installed in accordance with Section 304.1 of the *Mechanical Code*.

904.12.1 Manual system operation. A manual actuation device shall be located at or near a *means of egress* from the cooking area not less than 10 feet (3048 mm) and not more than 20 feet (6096 mm) from the kitchen exhaust system. The manual actuation device shall be installed not more than 48 inches (1200 mm) or less than 42 inches (1067 mm) above the floor and shall clearly identify the hazard protected. The manual actuation shall require a maximum force of 40 pounds (178 N) and a maximum movement of 14 inches (356 mm) to actuate the fire suppression system.

Exception: *Automatic sprinkler systems* shall not be required to be equipped with manual actuation means.

904.12.2 System interconnection. The actuation of the fire suppression system shall automatically shut down the fuel or electrical power supply to the cooking equipment. The fuel and electrical supply reset shall be manual.

904.12.3 Carbon dioxide systems. Where carbon dioxide systems are used, there shall be a nozzle at the top of the ventilating duct. Additional nozzles that are symmetrically arranged to give uniform distribution shall be installed within vertical ducts exceeding 20 feet (6096 mm) and horizontal ducts exceeding 50 feet (15 240 mm). *Dampers* shall be installed at either the top or the bottom of the duct and shall be arranged to operate automatically upon acti-

vation of the fire-extinguishing system. Where the *damper* is installed at the top of the duct, the top nozzle shall be immediately below the *damper*. Automatic carbon dioxide fire-extinguishing systems shall be sufficiently sized to protect against all hazards venting through a common duct simultaneously.

904.12.3.1 Ventilation system. Commercial-type cooking equipment protected by an automatic carbon dioxide-extinguishing system shall be arranged to shut off the ventilation system upon activation.

904.12.4 Special provisions for automatic sprinkler systems. *Automatic sprinkler systems* protecting commercial-type cooking equipment shall be supplied from a separate, readily accessible, indicating-type control valve that is identified.

904.12.4.1 Listed sprinklers. Sprinklers used for the protection of fryers shall be tested in accordance with UL 199E, *listed* for that application and installed in accordance with their listing.

904.13 Domestic cooking systems in Group I-2 Condition

1. In Group I-2 Condition 1, occupancies where cooking facilities are installed in accordance with Section 407.2.6 of this code, the domestic cooking hood provided over the cook-top or range shall be equipped with an automatic fire-extinguishing system of a type recognized for protection of domestic cooking equipment. Preengineered automatic extinguishing systems shall be tested in accordance with UL 300A and listed and labeled for the intended application. The system shall be installed in accordance with this code, its listing and the manufacturer's instructions.

904.13.1 Manual system operation and interconnection. Manual actuation and system interconnection for the hood suppression system shall be installed in accordance with Sections 904.12.1 and 904.12.2, respectively.

904.13.2 Portable fire extinguishers for domestic cooking equipment in Group I-2 Condition 1. A portable fire extinguisher complying with Section 906 shall be installed within a 30-foot (9144 mm) distance of travel from domestic cooking appliances.

SECTION 905 STANDPIPE SYSTEMS

905.1 General. Standpipe systems shall be provided in new buildings and structures in accordance with Sections 905.2 through 905.10. In buildings used for high-piled combustible storage, fire protection shall be in accordance with the *Fire Code*.

905.2 Installation standard. Standpipe systems shall be installed in accordance with this section and NFPA 14. Fire department connections for standpipe systems shall be installed in accordance with Section 912.

Exceptions:

1. The residual pressure of 100 psi for 2½-inch hose connection and 65 psi for 1½-inch hose connection is not required to be greater than 65 psi in buildings equipped throughout with an automatic

sprinkler system in accordance with Section 903.3.1.1 where the highest floor level is not more than 150 feet (45 720 mm) above the lowest level of fire department vehicle access.

2. No fire pump shall be required provided that the standpipes are capable of accepting delivery by fire department apparatus of a minimum of 250 gallons per minute (gpm) at 65 pounds per square inch (psi) to the topmost floor in buildings equipped throughout with an *automatic sprinkler system*, or a minimum of 500 gpm at 65 psi to the topmost floor in all other *buildings*, from the lowest level of fire department vehicle access.

905.3 Required installations. Standpipe systems shall be installed where required by Sections 905.3.1 through 905.3.8. Standpipe systems are allowed to be combined with *automatic sprinkler systems*.

Exception: Standpipe systems are not required in Group R-3 occupancies.

905.3.1 Building height. Class III standpipe systems shall be installed throughout buildings where the floor level of the highest *story* is located more than 30 feet (9144 mm) above the lowest level of fire department vehicle access, or where the floor level of the lowest story is located more than 30 feet (9144 mm) below the highest level of fire department vehicle access. In determining the lowest level of fire department vehicle access for purposes of this section, recessed loading docks for four vehicles or less shall be excluded. Conditions where topography makes access from the fire department vehicle to the building impractical or impossible shall be excluded from the determination of the lowest level or highest level of fire department vehicle access.

Exceptions:

1. Class I standpipes are allowed in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.
2. Class I manual standpipes are allowed in *open parking garages* where the highest floor is located not more than 150 feet (45 720 mm) above the lowest level of fire department vehicle access.
3. Class I manual dry standpipes are allowed in *open parking garages* that are subject to freezing temperatures, provided that the hose connections are located as required for Class II standpipes in accordance with Section 905.5.
4. Class I standpipes are allowed in *basements* equipped throughout with an *automatic sprinkler system*.
5. Hose stations for use by the building occupants shall be allowed, subject to the approval of the *Fire Chief*, provided that each hose connection is 2½ inches (63.5 mm) and is equipped with a 2½ inches by 1½ inches (63.5 mm by 38.2 mm) reducer and a cap attached with a chain.

905.3.2 Group A. Class I automatic wet standpipes shall be provided in nonsprinklered Group A buildings having an *occupant load* exceeding 1,000 persons.

Exceptions:

1. Open-air-seating spaces without enclosed spaces.
2. Class I automatic dry and semiautomatic dry standpipes or manual wet standpipes are allowed in buildings that are not high-rise buildings.

905.3.3 Covered and open mall buildings. Covered mall and open mall buildings shall be equipped throughout with a standpipe system where required by Section 905.3.1. Mall buildings not required to be equipped with a standpipe system by Section 905.3.1 shall be equipped with Class I hose connections connected to the *automatic sprinkler system* sized to deliver water at 250 gallons per minute (946.4 L/min) at the most hydraulically remote hose connection while concurrently supplying the automatic sprinkler system demand. The standpipe system shall be designed to not exceed a 50 pounds per square inch (psi) (345 kPa) residual pressure loss with a flow of 250 gallons per minute (946.4 L/min) from the fire department connection to the hydraulically most remote hose connection. Hose connections shall be provided at each of the following locations:

1. Within the mall at the entrance to each *exit* passageway or *corridor*.
2. At each floor-level landing within *interior exit stairways* opening directly on the mall.
3. At exterior public entrances to the mall of a covered mall building.
4. At public entrances at the perimeter line of an open mall building.
5. At other locations as necessary so that the distance to reach all portions of a tenant space does not exceed 200 feet (60 960 mm) from a hose connection.

905.3.4 Stages. Stages greater than 1,000 square feet in area (93 m²) shall be equipped with a Class III wet standpipe system with 1½-inch and 2½-inch (38 mm and 64 mm) hose connections on each side of the stage.

Exception: Where the building or area is equipped throughout with an *automatic sprinkler system*, a 1½-inch (38 mm) hose connection shall be installed in accordance with NFPA 13 or in accordance with NFPA 14 for Class II or III standpipes.

905.3.4.1 Hose and cabinet. The 1½-inch (38 mm) hose connections shall be equipped with sufficient lengths of 1½-inch (38 mm) hose to provide fire protection for the stage area. Hose connections shall be equipped with an *approved* adjustable fog nozzle and be mounted in a cabinet or on a rack.

905.3.5 Underground buildings. Underground buildings shall be equipped throughout with a Class I automatic wet or manual wet standpipe system.

905.3.6 Helistops and heliports. Buildings with a rooftop *helistop* or *heliport* shall be equipped with a Class I or III standpipe system extended to the roof level on which the *helistop* or *heliport* is located in accordance with Section 2007.5 of the *Fire Code*.

905.3.7 Marinas and boatyards. Standpipes in marinas and boatyards shall comply with Chapter 36 of the *Fire Code*.

905.3.8 Rooftop gardens and landscaped roofs. Buildings or structures that have rooftop gardens or landscaped roofs and that are equipped with a standpipe system shall have the standpipe system extended to the roof level on which the rooftop garden or landscaped roof is located.

905.4 Location of Class I standpipe hose connections. Class I standpipe hose connections shall be provided in all of the following locations:

1. In every required *interior exit stairway*, a hose connection shall be provided for each story above and below grade. Hose connections shall be located at an intermediate landing between stories, unless otherwise *approved* by the *fire code* official.
2. On each side of the wall adjacent to the *exit* opening of a *horizontal exit*.

Exception: Where floor areas adjacent to a *horizontal exit* are reachable from an *interior exit stairway* hose connection by a 30-foot (9144 mm) hose stream from a nozzle attached to 100 feet (30 480 mm) of hose, a hose connection shall not be required at the *horizontal exit*.

3. In every *exit* passageway, at the entrance from the *exit* passageway to other areas of a building.

Exception: Where floor areas adjacent to an *exit* passageway are reachable from an *interior exit stairway* hose connection by a 30-foot (9144 mm) hose stream from a nozzle attached to 100 feet (30 480 mm) of hose, a hose connection shall not be required at the entrance from the *exit* passageway to other areas of the building.

4. In covered mall buildings, adjacent to each exterior public entrance to the mall and adjacent to each entrance from an *exit* passageway or *exit* corridor to the mall. In open mall buildings, adjacent to each public entrance to the mall at the perimeter line and adjacent to each entrance from an *exit* passageway or *exit* corridor to the mall.
5. Where the roof has a slope less than four units vertical in 12 units horizontal (33.3-percent slope), a hose connection shall be located to serve the roof or at the highest landing of an *interior exit stairway* with access to the roof provided in accordance with Section 1011.12.

6. Where the most remote portion of a nonsprinklered floor or *story* is more than 150 feet (45 720 mm) from a hose connection or the most remote portion of a sprinklered floor or *story* is more than 200 feet (60 960 mm) from a hose connection, the *fire code* official is authorized to require that additional hose connections be provided in *approved* locations.

905.4.1 Protection. Risers and laterals of Class I standpipe systems not located within an *interior exit stairway* shall be protected by a degree of *fire resistance* equal to that required for vertical enclosures in the building in which they are located.

Exception: In buildings equipped throughout with an *approved automatic sprinkler system*, laterals that are not located within an *interior exit stairway* are not required to be enclosed within fire-resistance-rated construction.

905.4.2 Interconnection. In buildings where more than one standpipe is provided, the standpipes shall be interconnected in accordance with NFPA 14.

905.5 Location of Class II standpipe hose connections. Class II standpipe hose connections shall be accessible and located so that all portions of the building are within 30 feet (9144 mm) of a nozzle attached to 100 feet (30 480 mm) of hose.

905.5.1 Groups A-1 and A-2. In Group A-1 and A-2 occupancies having *occupant loads* exceeding 1,000 persons, hose connections shall be located on each side of any stage, on each side of the rear of the auditorium, on each side of the balcony and on each tier of dressing rooms.

905.5.2 Protection. Fire-resistance-rated protection of risers and laterals of Class II standpipe systems is not required.

905.5.3 Class II system 1-inch hose. A minimum 1-inch (25 mm) hose shall be allowed to be used for hose stations in light-hazard occupancies where investigated and *listed* for this service and where *approved* by the *fire code* official.

905.6 Location of Class III standpipe hose connections. Class III standpipe systems shall have hose connections located as required for Class I standpipes in Section 905.4 and shall have Class II hose connections as required in Section 905.5.

905.6.1 Protection. Risers and laterals of Class III standpipe systems shall be protected as required for Class I systems in accordance with Section 905.4.1.

905.6.2 Interconnection. In buildings where more than one Class III standpipe is provided, the standpipes shall be interconnected in accordance with NFPA 14.

905.7 Cabinets. Cabinets containing fire-fighting equipment such as standpipes, fire hoses, fire extinguishers or fire department valves shall not be blocked from use or obscured from view.

905.7.1 Cabinet equipment identification. Cabinets shall be identified in an *approved* manner by a permanently attached sign with letters not less than 2 inches (51 mm)

high in a color that contrasts with the background color, indicating the equipment contained therein.

Exceptions:

1. Doors not large enough to accommodate a written sign shall be marked with a permanently attached pictogram of the equipment contained therein.
2. Doors that have either an *approved* visual identification clear glass panel or a complete glass door panel are not required to be marked.

905.7.2 Locking cabinet doors. Cabinets shall be unlocked.

Exceptions:

1. Visual identification panels of glass or other *approved* transparent frangible material that is easily broken and allows access.
2. *Approved* locking arrangements.
3. Group I-3.

905.8 Dry standpipes. Dry standpipes shall not be installed.

Exception: Where subject to freezing and in accordance with NFPA 14.

905.9 Valve supervision. Valves controlling water supplies shall be supervised in the open position so that a change in the normal position of the valve will generate a supervisory signal at the supervising station required by Section 903.4. Where a fire alarm system is provided, a signal shall be transmitted to the control unit.

Exceptions:

1. Valves to underground key or hub valves in roadway boxes provided by the municipality or public utility do not require supervision.
2. Valves locked in the normal position and inspected as provided in this code in buildings not equipped with a fire alarm system.

905.10 During construction. Standpipe systems required during construction and demolition operations shall be provided in accordance with Section 3311.

SECTION 906 PORTABLE FIRE EXTINGUISHERS

906.1 Where required. Portable fire extinguishers shall be installed in all of the following locations:

1. In Group A, B, E, F, H, I, M, R-1, R-2, R-4 and S occupancies.

Exceptions:

1. In Group R-2 occupancies, portable fire extinguishers shall be required only in locations specified in Items 2 through 6 where each *dwelling unit* is provided with a portable fire extinguisher having a minimum rating of 1-A:10-B:C.
2. In Group E occupancies, portable fire extinguishers shall be required only in locations specified in

Items 2 through 6 where each classroom is provided with a portable fire extinguisher having a minimum rating of 2-A:20-B:C.

3. Within 30 feet (9144 mm) distance of travel from commercial cooking equipment and from domestic cooking equipment in Group I-1; Group I-2, Condition 1; and Group R-2 college dormitory occupancies..
4. In areas where flammable or *combustible liquids* are stored, used or dispensed.
5. On each floor of structures under construction, except Group R-3 occupancies, in accordance with Section 3315.1 of the *Fire Code*.
6. Where required by the *Fire Code* sections indicated in Table 906.1.
7. Special-hazard areas, including but not limited to laboratories, computer rooms and generator rooms, where required by the *fire code official*.

906.2 General requirements. Portable fire extinguishers shall be selected and installed in accordance with this section and NFPA 10.

Exceptions:

1. The distance of travel to reach an extinguisher shall not apply to the spectator seating portions of Group A-5 occupancies.
2. In Group I-3, portable fire extinguishers shall be permitted to be located at staff locations.

906.3 Size and distribution. The size and distribution of portable fire extinguishers shall be in accordance with Sections 906.3.1 through 906.3.4.

906.3.1 Class A fire hazards. The minimum sizes and distribution of portable fire extinguishers for occupancies that involve primarily Class A fire hazards shall comply with Table 906.3(1).

906.3.2 Class B fire hazards. Portable fire extinguishers for occupancies involving flammable or combustible liquids with depths less than or equal to 0.25-inch (6.4 mm) shall be selected and placed in accordance with Table 906.3(2).

Portable fire extinguishers for occupancies involving flammable or combustible liquids with a depth of greater than 0.25-inch (6.4 mm) shall be selected and placed in accordance with NFPA 10.

906.3.3 Class C fire hazards. Portable fire extinguishers for Class C fire hazards shall be selected and placed on the basis of the anticipated Class A or B hazard.

906.3.4 Class D fire hazards. Portable fire extinguishers for occupancies involving combustible metals shall be selected and placed in accordance with NFPA 10.

906.4 Cooking grease fires. Fire extinguishers provided for the protection of cooking grease fires shall be of an *approved* type compatible with the automatic fire-extinguishing system agent and in accordance with Section 904.12.5 of the *Fire Code*.

**TABLE 906.1
ADDITIONAL REQUIRED PORTABLE FIRE EXTINGUISHERS IN
THE FIRE CODE**

| IFC SECTION | SUBJECT |
|--------------|--|
| 303.5 | Asphalt kettles |
| 307.5 | Open burning |
| 308.1.3 | Open flames—torches |
| 309.4 | Powered industrial trucks |
| 2005.2 | Aircraft towing vehicles |
| 2005.3 | Aircraft welding apparatus |
| 2005.4 | Aircraft fuel-servicing tank vehicles |
| 2005.5 | Aircraft hydrant fuel-servicing vehicles |
| 2005.6 | Aircraft fuel-dispensing stations |
| 2007.7 | Heliports and helistops |
| 2108.4 | Dry cleaning plants |
| 2305.5 | Motor fuel-dispensing facilities |
| 2310.6.4 | Marine motor fuel-dispensing facilities |
| 2311.6 | Repair garages |
| 2404.4.1 | Spray-finishing operations |
| 2405.4.2 | Dip-tank operations |
| 2406.4.2 | Powder-coating areas |
| 2804.3 | Lumberyards/woodworking facilities |
| 2808.8 | Recycling facilities |
| 2809.5 | Exterior lumber storage |
| 2903.5 | Organic-coating areas |
| 3006.3 | Industrial ovens |
| 3104.12 | Tents and membrane structures |
| 3206.10 | High-piled storage |
| 3315.1 | Buildings under construction or demolition |
| 3317.3 | Roofing operations |
| 3408.2 | Tire rebuilding/storage |
| 3504.2.6 | Welding and other hot work |
| 3604.4 | Marinas |
| 3703.6 | Combustible fibers |
| 5703.2.1 | Flammable and combustible liquids, general |
| 5704.3.3.1 | Indoor storage of flammable and combustible liquids |
| 5704.3.7.5.2 | Liquid storage rooms for flammable and combustible liquids |
| 5705.4.9 | Solvent distillation units |
| 5706.2.7 | Farms and construction sites—flammable and combustible liquids storage |
| 5706.4.10.1 | Bulk plants and terminals for flammable and combustible liquids |
| 5706.5.4.5 | Commercial, industrial, governmental or manufacturing establishments—fuel dispensing |
| 5706.6.4 | Tank vehicles for flammable and combustible liquids |
| 5906.5.7 | Flammable solids |
| 6108.2 | LP-gas |

TABLE 906.3(1)
FIRE EXTINGUISHERS FOR CLASS A FIRE HAZARDS

| | LIGHT (Low) HAZARD OCCUPANCY | ORDINARY (Moderate) HAZARD OCCUPANCY | EXTRA (High) HAZARD OCCUPANCY |
|--|---|---|--|
| Minimum rated single extinguisher | 2-A ^c | 2-A | 4-A ^a |
| Maximum floor area per unit of A | 3,000 square feet | 1,500 square feet | 1,000 square feet |
| Maximum floor area for extinguisher ^b | 11,250 square feet | 11,250 square feet | 11,250 square feet |
| Maximum distance of travel to extinguisher | 75 feet | 75 feet | 75 feet |

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929m², 1 gallon = 3.785 L.

- Two 2½-gallon water-type extinguishers shall be deemed the equivalent of one 4-A rated extinguisher.
- Annex E.3.3 of NFPA 10 provides more details concerning application of the maximum floor area criteria.
- Two water-type extinguishers each with a 1-A rating shall be deemed the equivalent of one 2-A rated extinguisher for Light (Low) Hazard Occupancies.

TABLE 906.3(2)
**FIRE EXTINGUISHERS FOR FLAMMABLE OR
COMBUSTIBLE LIQUIDS WITH DEPTHS
LESS THAN OR EQUAL TO 0.25 INCH**

| TYPE OF HAZARD | BASIC MINIMUM EXTINGUISHER RATING | MAXIMUM DISTANCE OF TRAVEL TO EXTINGUISHERS (feet) |
|------------------------|--|---|
| Light (Low) | 5-B | 30 |
| | 10-B | 50 |
| Ordinary (Moderate) | 10-B | 30 |
| | 20-B | 50 |
| Extra (High) | 40-B | 30 |
| | 80-B | 50 |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

Note: For requirements on water-soluble flammable liquids and alternative sizing criteria, see Section 5.5 of NFPA 10.

906.5 Conspicuous location. Portable fire extinguishers shall be located in conspicuous locations where they will be readily accessible and immediately available for use. These locations shall be along normal paths of travel, unless the *fire code* official determines that the hazard posed indicates the need for placement away from normal paths of travel.

906.6 Unobstructed and unobscured. Portable fire extinguishers shall not be obstructed or obscured from view. In rooms or areas in which visual obstruction cannot be completely avoided, means shall be provided to indicate the locations of extinguishers.

906.7 Hangers and brackets. Hand-held portable fire extinguishers, not housed in cabinets, shall be installed on the hangers or brackets supplied. Hangers or brackets shall be securely anchored to the mounting surface in accordance with the manufacturer's installation instructions.

906.8 Cabinets. Cabinets used to house portable fire extinguishers shall not be locked.

Exceptions:

- Where portable fire extinguishers subject to malicious use or damage are provided with a means of ready access.
- In Group I-3 occupancies and in mental health areas in Group I-2 occupancies, access to portable fire extinguishers shall be permitted to be locked or to be located in staff locations provided the staff has keys.

906.9 Extinguisher installation. The installation of portable fire extinguishers shall be in accordance with Sections 906.9.1 through 906.9.3.

906.9.1 Extinguishers weighing 40 pounds or less. Portable fire extinguishers having a gross weight not exceeding 40 pounds (18 kg) shall be installed so that their tops are not more than 5 feet (1524 mm) above the floor.

906.9.2 Extinguishers weighing more than 40 pounds. Hand-held portable fire extinguishers having a gross weight exceeding 40 pounds (18 kg) shall be installed so that their tops are not more than 3.5 feet (1067 mm) above the floor.

906.9.3 Floor clearance. The clearance between the floor and the bottom of installed hand-held portable fire extinguishers shall be not less than 4 inches (102 mm).

906.10 Wheeled units. Wheeled fire extinguishers shall be conspicuously located in a designated location.

SECTION 907

FIRE ALARM AND DETECTION SYSTEMS

907.1 General. This section covers the application, installation, performance and maintenance of fire alarm systems and their components.

907.1.1 Construction documents. *Construction documents* for fire alarm systems shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of this code, the *Fire Code* and relevant laws, ordinances, rules and regulations, as determined by the *fire code* official.

907.1.2 Fire alarm shop drawings. Shop drawings for fire alarm systems shall be submitted for review and approval prior to system installation, and shall include, but not be limited to, all of the following where applicable to the system being installed:

- A floor plan that indicates the use of all rooms.
- Locations of alarm-initiating devices.
- Locations of alarm notification appliances, including candela ratings for visible alarm notification appliances.
- Design minimum audibility level for occupant notification.

5. Location of fire alarm control unit, transponders and notification power supplies.
6. Annunciators.
7. Power connection.
8. Battery calculations.
9. Conductor type and sizes.
10. Voltage drop calculations.
11. Manufacturers' data sheets indicating model numbers and listing information for equipment, devices and materials.
12. Details of ceiling height and construction.
13. The interface of fire safety control functions.
14. Classification of the supervising station.

907.1.3 Equipment. Systems and components shall be *listed* and *approved* for the purpose for which they are installed.

907.2 Where required—new buildings and structures. An *approved* fire alarm system installed in accordance with the provisions of this code and NFPA 72 shall be provided in new buildings and structures in accordance with Sections 907.2.1 through 907.2.23 and provide occupant notification in accordance with Section 907.5, unless other requirements are provided by another section of this code.

Not fewer than one manual fire alarm box shall be provided in an *approved* location to initiate a fire alarm signal for fire alarm systems employing automatic fire detectors or waterflow detection devices. Where other sections of this code allow elimination of fire alarm boxes due to sprinklers, a single fire alarm box shall be installed.

Exceptions:

1. The manual fire alarm box is not required for fire alarm systems dedicated to elevator recall control and supervisory service.
2. The manual fire alarm box is not required for Group R-2 occupancies unless required by the *fire code* official to provide a means for fire watch personnel to initiate an alarm during a sprinkler system impairment event. Where provided, the manual fire alarm box shall not be located in an area that is accessible to the public.

907.2.1 Group A. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group A occupancies where the occupant load due to the assembly occupancy is 300 or more. Group A occupancies not separated from one another in accordance with Section 707.3.10 shall be considered as a single occupancy for the purposes of applying this section. Portions of Group E occupancies occupied for assembly purposes shall be provided with a fire alarm system as required for the Group E occupancy.

Exception: Manual fire alarm boxes are not required where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 and the occupant notification appli-

ances will activate throughout the notification zones upon sprinkler water flow.

907.2.1.1 System initiation in Group A occupancies with an occupant load of 1,000 or more. Activation of the fire alarm in Group A occupancies with an *occupant load* of 1,000 or more shall initiate a signal using an emergency voice/alarm communications system in accordance with Section 907.5.2.2.

Exception: Where *approved*, the prerecorded announcement is allowed to be manually deactivated for a period of time, not to exceed 3 minutes, for the sole purpose of allowing a live voice announcement from an *approved, constantly attended location*.

907.2.1.2 Emergency voice/alarm communication captions. Stadiums, arenas and grandstands required to caption audible public announcements shall be in accordance with Section 907.5.2.2.4.

907.2.2 Group B. A manual fire alarm system shall be installed in Group B occupancies where one of the following conditions exists:

1. The combined Group B *occupant load* of all floors is 500 or more.
2. The Group B *occupant load* is more than 100 persons above or below the lowest *level of exit discharge*.
3. The *fire area* contains an ambulatory care facility.

Exception: Manual fire alarm boxes are not required where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 and the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

907.2.2.1 Ambulatory care facilities. *Fire areas* containing ambulatory care facilities shall be provided with an electronically supervised automatic smoke detection system installed within the ambulatory care facility and in public use areas outside of tenant spaces, including public *corridors* and elevator lobbies.

Exception: Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, provided the occupant notification appliances will activate throughout the notification zones upon sprinkler waterflow.

907.2.3 Group E. A manual fire alarm system that initiates the occupant notification signal utilizing an emergency voice/alarm communication system meeting the requirements of Section 907.5.2.2 and installed in accordance with Section 907.6 shall be installed in Group E occupancies. When *automatic sprinkler systems* or smoke detectors are installed, such systems or detectors shall be connected to the building fire alarm system.

Exceptions:

1. A manual fire alarm system is not required in Group E occupancies with an *occupant load* of 50 or less.

2. Emergency voice/alarm communication systems meeting the requirements of Section 907.5.2.2 and installed in accordance with Section 907.6 shall not be required in Group E occupancies with occupant loads of 100 or less, provided that activation of the manual fire alarm system initiates an *approved* occupant notification signal in accordance with Section 907.5.
3. Manual fire alarm boxes are not required in Group E occupancies where all of the following apply:
 - 3.1. Interior *corridors* are protected by smoke detectors.
 - 3.2. Auditoriums, cafeterias, gymnasiums and similar areas are protected by *heat detectors* or other *approved* detection devices.
 - 3.3. Shops and laboratories involving dusts or vapors are protected by *heat detectors* or other *approved* detection devices.
4. Manual fire alarm boxes shall not be required in Group E occupancies where all of the following apply:
 - 4.1. The building is equipped throughout with an *approved automatic sprinkler system* installed in accordance with Section 903.3.1.1.
 - 4.2. The emergency voice/alarm communication system will activate on sprinkler waterflow.
 - 4.3. Manual activation is provided from a normally occupied location.

907.2.4 Group F. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group F occupancies where both of the following conditions exist:

1. The Group F occupancy is two or more *stories* in height.
2. The Group F occupancy has a combined *occupant load* of 500 or more above or below the lowest *level of exit discharge*.

Exception: Manual fire alarm boxes are not required where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 and the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

907.2.5 Group H. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group H-5 occupancies and in occupancies used for the manufacture of organic coatings. An automatic smoke detection system shall be installed for highly toxic gases, organic peroxides and oxidizers in accordance with Chapters 60, 62 and 63, respectively, of the *Fire Code*.

907.2.6 Group I. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group I occupancies. An automatic smoke detection system that activates the occupant notification system in accordance with Section 907.5 shall be provided in accordance with Sections 907.2.6.1, 907.2.6.2 and 907.2.6.3.3.

Exceptions:

1. Manual fire alarm boxes in sleeping units of Group I-1 and I-2 occupancies shall not be required at *exits* if located at all care providers' control stations or other constantly attended staff locations, provided such stations are visible and continuously accessible and that the distances of travel required in Section 907.4.2.1 are not exceeded.
2. Occupant notification systems are not required to be activated where private mode signaling installed in accordance with NFPA 72 is *approved* by the *fire code* official and staff evacuation responsibilities are included in the fire safety and evacuation plan required by Section 404 of the *Fire Code*.

907.2.6.1 Group I-1. In Group I-1 occupancies, an automatic smoke detection system shall be installed in *corridors*, waiting areas open to *corridors* and *habitable spaces* other than *sleeping units* and kitchens. The system shall be activated in accordance with Section 907.5.

Exceptions:

1. For Group I-1 Condition 1 occupancies, smoke detection in *habitable spaces* is not required where the facility is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1.
2. Smoke detection is not required for exterior balconies.

907.2.6.1.1 Smoke alarms. Single- and multiple-station smoke alarms shall be installed in accordance with Section 907.2.11.

907.2.6.2 Group I-2. An automatic smoke detection system shall be installed in *corridors* in Group I-2 Condition 1 facilities and spaces permitted to be open to the *corridors* by Section 407.2. The system shall be activated in accordance with Section 907.4. Group I-2 Condition 2 occupancies shall be equipped with an automatic smoke detection system as required in Section 407.

Exceptions:

1. Corridor smoke detection is not required in smoke compartments that contain sleeping units where such units are provided with smoke detectors that comply with UL 268. Such detectors shall provide a visual display on the corridor side of each sleeping unit and

shall provide an audible and visual alarm at the care providers' station attending each unit.

2. Corridor smoke detection is not required in smoke compartments that contain sleeping units where sleeping unit doors are equipped with automatic door-closing devices with integral smoke detectors on the unit sides installed in accordance with their listing, provided that the integral detectors perform the required alerting function.

907.2.6.3 Group I-3 occupancies. Group I-3 occupancies shall be equipped with a manual fire alarm system and automatic smoke detection system installed for alerting staff.

907.2.6.3.1 System initiation. Actuation of an automatic fire-extinguishing system, *automatic sprinkler system*, a manual fire alarm box or a fire detector shall initiate an approved fire alarm signal that automatically notifies staff.

907.2.6.3.2 Manual fire alarm boxes. Manual fire alarm boxes are not required to be located in accordance with Section 907.4.2 where the fire alarm boxes are provided at staff-attended locations having direct supervision over areas where manual fire alarm boxes have been omitted.

907.2.6.3.2.1 Manual fire alarm boxes in detainee areas. Manual fire alarm boxes are allowed to be locked in areas occupied by detainees, provided that staff members are present within the subject area and have keys readily available to operate the manual fire alarm boxes.

907.2.6.3.3 Automatic smoke detection system. An automatic smoke detection system shall be installed throughout resident housing areas, including *sleeping units* and contiguous day rooms, group activity spaces and other common spaces normally accessible to residents.

Exceptions:

1. Other *approved* smoke detection arrangements providing equivalent protection, including, but not limited to, placing detectors in exhaust ducts from cells or behind protective guards *listed* for the purpose, are allowed when necessary to prevent damage or tampering.
2. *Sleeping units* in Use Conditions 2 and 3 as described in Section 308.
3. Smoke detectors are not required in *sleeping units* with four or fewer occupants in smoke compartments that are equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1.

907.2.7 Group M. A manual fire alarm system that activates the occupant notification system in accordance with

Section 907.5 shall be installed in Group M occupancies where one of the following conditions exists:

1. The combined Group M *occupant load* of all floors is 500 or more persons.
2. The Group M *occupant load* is more than 100 persons above or below the lowest *level of exit discharge*.

Exceptions:

1. A manual fire alarm system is not required in *covered or open mall buildings* complying with Section 402.
2. Manual fire alarm boxes are not required where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 and the occupant notification appliances will automatically activate throughout the notification zones upon sprinkler water flow.

907.2.7.1 Occupant notification. During times that the building is occupied, the initiation of a signal from a manual fire alarm box or from a waterflow switch shall not be required to activate the alarm notification appliances when an alarm signal is activated at a *constantly attended location* from which evacuation instructions shall be initiated over an emergency voice/alarm communication system installed in accordance with Section 907.5.2.2.

907.2.8 Group R-1. Fire alarm systems and smoke alarms shall be installed in Group R-1 occupancies as required in Sections 907.2.8.1 through 907.2.8.3.

907.2.8.1 Manual fire alarm system. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group R-1 occupancies.

Exceptions:

1. A manual fire alarm system is not required in buildings not more than two *stories* in height where all individual *sleeping units* and contiguous *attic* and crawl spaces to those units are separated from each other and public or common areas by not less than 1-hour *fire partitions* and each individual *sleeping unit* has an *exit* directly to a *public way*, *egress court* or *yard*.
2. Manual fire alarm boxes are not required throughout the building where all of the following conditions are met:
 - 2.1. The building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2.
 - 2.2. The notification appliances will activate upon sprinkler water flow.

- 2.3. Not fewer than one manual fire alarm box is installed at an *approved* location.

907.2.8.2 Automatic smoke detection system. An automatic smoke detection system that activates the occupant notification system in accordance with Section 907.5 shall be installed throughout all interior *corridors* serving *sleeping units*.

Exception: An automatic smoke detection system is not required in buildings that do not have interior *corridors* serving *sleeping units* and where each *sleeping unit* has a *means of egress* door opening directly to an *exit* or to an exterior *exit access* that leads directly to an *exit*.

907.2.8.3 Smoke alarms. Single- and multiple-station smoke alarms shall be installed in accordance with Section 907.2.11.

907.2.9 Group R-2. Fire alarm systems and smoke alarms shall be installed in Group R-2 occupancies as required in Sections 907.2.9.1 through 907.2.9.3.

907.2.9.1 Manual fire alarm system. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group R-2 occupancies where any of the following conditions apply:

1. Any *dwelling unit* or *sleeping unit* is located three or more *stories* above the lowest *level of exit discharge*.
2. Any *dwelling unit* or *sleeping unit* is located more than one *story* below the highest *level of exit discharge* of *exits* serving the *dwelling unit* or *sleeping unit*.
3. The building contains more than 16 *dwelling units* or *sleeping units*.

Exceptions:

1. A fire alarm system is not required in buildings not more than two *stories* in height where all *dwelling units* or *sleeping units* and contiguous *attic* and crawl spaces are separated from each other and public or common areas by not less than 1-hour *fire partitions* and each *dwelling unit* or *sleeping unit* has an *exit* directly to a *public way*, *egress court* or *yard*.
2. Manual fire alarm boxes are not required where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2 and the occupant notification appliances will automatically activate throughout the notification zones upon a sprinkler water flow.
3. A fire alarm system is not required in buildings that do not have interior *corridors* serving *dwelling units* and are protected by an *approved automatic sprinkler system* installed in accordance with Section 903.3.1.1 or

903.3.1.2, provided that *dwelling units* either have a *means of egress* door opening directly to an exterior *exit access* that leads directly to the *exits* or are served by open-ended *corridors* designed in accordance with Section 1027.6, Exception 3.

907.2.9.2 Smoke alarms. Single- and multiple-station smoke alarms shall be installed in accordance with Section 907.2.11.

907.2.9.3 Group R-2 college and university buildings. An automatic smoke detection system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group R-2 occupancies operated by a college or university for student or staff housing in all of the following locations:

1. Common spaces outside of *dwelling units* and *sleeping units*.
2. Laundry rooms, mechanical equipment rooms and storage rooms.
3. All interior corridors serving *sleeping units* or *dwelling units*.

Exception: An automatic smoke detection system is not required in buildings that do not have interior *corridors* serving *sleeping units* or *dwelling units* and where each *sleeping unit* or *dwelling unit* either has a *means of egress* door opening directly to an exterior *exit access* that leads directly to an *exit* or a *means of egress* door opening directly to an *exit*.

Required smoke alarms in *dwelling units* and *sleeping units* in Group R-2 occupancies operated by a college or university for student or staff housing shall be interconnected with the fire alarm system in accordance with NFPA 72.

907.2.10 Group R-4. Fire alarm systems and smoke alarms shall be installed in Group R-4 occupancies as required in Sections 907.2.10.1 through 907.2.10.3.

907.2.10.1 Manual fire alarm system. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group R-4 occupancies.

Exceptions:

1. A manual fire alarm system is not required in buildings not more than two *stories* in height where all individual *sleeping units* and contiguous *attic* and crawl spaces to those units are separated from each other and public or common areas by not less than 1-hour *fire partitions* and each individual *sleeping unit* has an *exit* directly to a *public way*, *egress court* or *yard*.
2. Manual fire alarm boxes are not required throughout the building where all of the following conditions are met:
 - 2.1. The building is equipped throughout with an *automatic sprinkler system*

installed in accordance with Section 903.3.1.1 or 903.3.1.2.

- 2.2. The notification appliances will activate upon sprinkler water flow.
- 2.3. Not fewer than one manual fire alarm box is installed at an *approved* location.
3. Manual fire alarm boxes in resident or patient sleeping areas shall not be required at *exits* where located at all nurses' control stations or other constantly attended staff locations, provided such stations are visible and continuously accessible and that the distances of travel required in Section 907.4.2.1 are not exceeded.

907.2.10.2 Automatic smoke detection system. An automatic smoke detection system that activates the occupant notification system in accordance with Section 907.5 shall be installed in *corridors*, waiting areas open to *corridors* and *habitable spaces* other than *sleeping units* and kitchens.

Exceptions:

1. Smoke detection in *habitable spaces* is not required where the facility is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1.
2. An automatic smoke detection system is not required in buildings that do not have interior *corridors* serving *sleeping units* and where each *sleeping unit* has a *means of egress* door opening directly to an *exit* or to an exterior *exit access* that leads directly to an *exit*.

907.2.10.3 Smoke alarms. Single- and multiple-station smoke alarms shall be installed in accordance with Section 907.2.11.

907.2.11 Single- and multiple-station smoke alarms. Listed single- and multiple-station smoke alarms complying with UL 217 shall be installed in accordance with Sections 907.2.11.1 through 907.2.11.6 and NFPA 72.

907.2.11.1 Group R-1. Single- or multiple-station smoke alarms shall be installed in all of the following locations in Group R-1:

1. In sleeping areas.
2. In every room in the path of the *means of egress* from the sleeping area to the door leading from the *sleeping unit*.
3. In each *story* within the *sleeping unit*, including basements. For *sleeping units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.

907.2.11.2 Groups R-2, R-3, R-4 and I-1. Single- or multiple-station smoke alarms shall be installed and

maintained in Groups R-2, R-3, R-4 and I-1 regardless of *occupant load* at all of the following locations:

1. On the ceiling or wall outside of each separate sleeping area in the immediate vicinity of bedrooms.
2. In each room used for sleeping purposes.
3. In each *story* within a *dwelling unit*, including basements but not including crawl spaces and uninhabitable *attics*. In *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.

907.2.11.3 Installation near cooking appliances. Smoke alarms shall not be installed in the following locations unless this would prevent placement of a smoke alarm in a location required by Section 907.2.11.1 or 907.2.11.2:

1. Ionization smoke alarms shall not be installed less than 20 feet (6096 mm) horizontally from a permanently installed cooking appliance.
2. Ionization smoke alarms with an alarm-silencing switch shall not be installed less than 10 feet (3048 mm) horizontally from a permanently installed cooking appliance.
3. Photoelectric smoke alarms shall not be installed less than 6 feet (1829 mm) horizontally from a permanently installed cooking appliance.

907.2.11.4 Installation near bathrooms. Smoke alarms shall be installed not less than 3 feet (914 mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by Section 907.2.11.1 or 907.2.11.2.

907.2.11.5 Interconnection. Where more than one smoke alarm is required to be installed within an individual *dwelling unit* or *sleeping unit* in Group R or I-1 occupancies, the smoke alarms shall be interconnected in such a manner that the activation of one alarm will activate all of the alarms in the individual unit. Physical interconnection of smoke alarms shall not be required where listed wireless alarms are installed and all alarms sound upon activation of one alarm. The alarm shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed.

907.2.11.6 Power source. In new construction, required smoke alarms shall receive their primary power from the building wiring where such wiring is served from a commercial source and shall be equipped with a battery backup. Smoke alarms with integral strobes that are not equipped with battery backup shall be connected to an emergency electrical system in accordance with Section 2702. Smoke alarms shall emit a signal when the batteries are low. Wiring shall be per-

manent and without a disconnecting switch other than as required for overcurrent protection.

Exception: Smoke alarms are not required to be equipped with battery backup where they are connected to an emergency electrical system that complies with Section 2702.

907.2.11.7 Smoke detection system. Smoke detectors listed in accordance with UL 268 and provided as part of the building *fire alarm system* shall be an acceptable alternative to single- and multiple-station *smoke alarms* and shall comply with the following:

1. The *fire alarm system* shall comply with all applicable requirements in Section 907.
2. Activation of a smoke detector in a *dwelling unit* or *sleeping unit* shall initiate alarm notification in the *dwelling unit* or *sleeping unit* in accordance with Section 907.5.2.
3. Activation of a smoke detector in a *dwelling unit* or *sleeping unit* shall not activate alarm notification appliances outside of the *dwelling unit* or *sleeping unit*, provided that a supervisory signal is generated and monitored in accordance with Section 907.6.6.

907.2.12 Special amusement buildings. An automatic smoke detection system shall be provided in *special amusement buildings* in accordance with Sections 907.2.12.1 through 907.2.12.3.

907.2.12.1 Alarm. Activation of any single smoke detector, the *automatic sprinkler system* or any other automatic fire detection device shall immediately activate an audible and visible alarm at the building at a constantly attended location from which emergency action can be initiated, including the capability of manual initiation of requirements in Section 907.2.12.2.

907.2.12.2 System response. The activation of two or more smoke detectors, a single smoke detector equipped with an alarm verification feature, the *automatic sprinkler system* or other *approved* fire detection device shall automatically do all of the following:

1. Cause illumination of the *means of egress* with light of not less than 1 footcandle (11 lux) at the walking surface level.
2. Stop any conflicting or confusing sounds and visual distractions.
3. Activate an *approved* directional *exit* marking that will become apparent in an emergency.
4. Activate a prerecorded message, audible throughout the *special amusement building*, instructing patrons to proceed to the nearest *exit*. Alarm signals used in conjunction with the prerecorded message shall produce a sound that is distinctive from other sounds used during normal operation.

907.2.12.3 Emergency voice/alarm communication system. An emergency voice/alarm communication system, which is also allowed to serve as a public address system, shall be installed in accordance with

Section 907.5.2.2 and be audible throughout the entire *special amusement building*.

907.2.13 High-rise buildings. High-rise buildings shall be provided with an automatic smoke detection system in accordance with Section 907.2.13.1, a fire department communication system in accordance with Section 907.2.13.2 and an emergency voice/alarm communication system in accordance with Section 907.5.2.2.

Exceptions:

1. Airport traffic control towers in accordance with Sections 412 and 907.2.22.
2. *Open parking garages* in accordance with Section 406.5.
3. Buildings with an occupancy in Group A-5 in accordance with Section 303.1.
4. Low-hazard special occupancies in accordance with Section 503.1.1.
5. Buildings with an occupancy in Group H-1, H-2 or H-3 in accordance with Section 415.
6. In Group I-1 and I-2 occupancies, the alarm shall sound at a *constantly attended location* and occupant notification shall be broadcast by the emergency voice/alarm communication system.

907.2.13.1 Automatic smoke detection. Automatic smoke detection in high-rise buildings shall be in accordance with Sections 907.2.13.1.1 and 907.2.13.1.2.

907.2.13.1.1 Area smoke detection. Area smoke detectors shall be provided in accordance with this section. Smoke detectors shall be connected to an automatic fire alarm system. The activation of any detector required by this section shall activate the emergency voice/alarm communication system in accordance with Section 907.5.2.2. In addition to smoke detectors required by Sections 907.2.1 through 907.2.10, smoke detectors shall be located as follows:

1. In each mechanical equipment, electrical, transformer, telephone equipment or similar room that is not provided with sprinkler protection.
2. In each elevator machine room, machinery space, control room and control space and in elevator lobbies.

907.2.13.1.2 Duct smoke detection. Duct smoke detectors complying with Section 907.3.1 shall be located as follows:

1. In the main return air and exhaust air plenum of each air-conditioning system having a capacity greater than 2,000 cubic feet per minute (cfm) (0.94 m³/s). Such detectors shall be located in a serviceable area downstream of the last duct inlet.
2. At each connection to a vertical duct or riser serving two or more stories from a return air

duct or plenum of an air-conditioning system. In Group R-1 and R-2 occupancies, a smoke detector is allowed to be used in each return air riser carrying not more than 5,000 cfm (2.4 m³/s) and serving not more than 10 air-inlet openings.

907.2.13.2 Fire department communication system.

Where a wired communication system is *approved* in lieu of an emergency responder radio coverage system in accordance with Section 510 of the *Fire Code*, the wired fire department communication system shall be designed and installed in accordance with NFPA 72 and shall operate between a fire command center complying with Section 911, elevators, elevator lobbies, emergency and standby power rooms, fire pump rooms, *areas of refuge* and inside *interior exit stairways*. The fire department communication device shall be provided at each floor level within the *interior exit stairway*.

907.2.14 Atriums connecting more than two stories. A fire alarm system shall be installed in occupancies with an atrium that connects more than two *stories*, with smoke detection installed in locations required by a rational analysis in Section 909.4 and in accordance with the system operation requirements in Section 909.17. The system shall be activated in accordance with Section 907.5. Such occupancies in Group A, E or M shall be provided with an emergency voice/alarm communication system complying with the requirements of Section 907.5.2.2.

907.2.15 High-piled combustible storage areas. An automatic smoke detection system shall be installed throughout high-piled combustible storage areas where required by Section 3206.5 of the *Fire Code*.

907.2.16 Aerosol storage uses. Aerosol storage rooms and general-purpose warehouses containing aerosols shall be provided with an *approved* manual fire alarm system where required by the *Fire Code*.

907.2.17 Lumber, wood structural panel and veneer mills. Lumber, wood structural panel and veneer mills shall be provided with a manual fire alarm system.

907.2.18 Underground buildings with smoke control systems. Where a smoke control system is installed in an underground building in accordance with this code, automatic smoke detectors shall be provided in accordance with Section 907.2.18.1.

907.2.18.1 Smoke detectors. Not fewer than one smoke detector *listed* for the intended purpose shall be installed in all of the following areas:

1. Mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar rooms.
2. Elevator lobbies.
3. The main return and exhaust air plenum of each air-conditioning system serving more than one *story* and located in a serviceable area downstream of the last duct inlet.

4. Each connection to a vertical duct or riser serving two or more floors from return air ducts or plenums of heating, ventilating and air-conditioning systems, except that in Group R occupancies, a *listed* smoke detector is allowed to be used in each return air riser carrying not more than 5,000 cfm (2.4 m³/s) and serving not more than 10 air-inlet openings.

907.2.18.2 Alarm required. Activation of the smoke control system shall activate an audible alarm at a *constantly attended location*.

907.2.19 Deep underground buildings. Where the lowest level of a structure is more than 60 feet (18 288 mm) below the finished floor of the lowest *level of exit discharge*, the structure shall be equipped throughout with a manual fire alarm system, including an emergency voice/alarm communication system installed in accordance with Section 907.5.2.2.

907.2.20 Covered and open mall buildings. Where the total floor area exceeds 50,000 square feet (4645 m²) within either a covered mall building or within the perimeter line of an open mall building, an emergency voice/alarm communication system shall be provided. Emergency voice/alarm communication systems serving a mall, required or otherwise, shall be accessible to the fire department. The system shall be provided in accordance with Section 907.5.2.2.

907.2.21 Residential aircraft hangars. Not fewer than one single-station smoke alarm shall be installed within a residential aircraft hangar as defined in Chapter 2 and shall be interconnected into the residential smoke alarm or other sounding device to provide an alarm that will be audible in all sleeping areas of the *dwelling*.

907.2.22 Airport traffic control towers. An automatic smoke detection system that activates the occupant notification system in accordance with Section 907.5 shall be provided in airport control towers in accordance with Sections 907.2.22.1 and 907.2.22.2.

Exception: Audible appliances shall not be installed within the control tower cab.

907.2.22.1 Airport traffic control towers with multiple exits and automatic sprinklers. Airport traffic control towers with multiple *exits* and equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 shall be provided with smoke detectors in all of the following locations:

1. Airport traffic control cab.
2. Electrical and mechanical equipment rooms.
3. Airport terminal radar and electronics rooms.
4. Outside each opening into *interior exit stairways*.
5. Along the single *means of egress* permitted from observation levels.
6. Outside each opening into the single *means of egress* permitted from observation levels.

907.2.22.2 Other airport traffic control towers. Airport traffic control towers with a single *exit* or where sprinklers are not installed throughout shall be provided with smoke detectors in all of the following locations:

1. Airport traffic control cab.
2. Electrical and mechanical equipment rooms.
3. Airport terminal radar and electronics rooms.
4. Office spaces incidental to the tower operation.
5. Lounges for employees, including sanitary facilities.
6. *Means of egress.*
7. Accessible utility shafts.

907.2.23 Battery rooms. An automatic smoke detection system shall be installed in areas containing stationary storage battery systems with a liquid capacity of more than 50 gallons (189 L).

907.3 Fire safety functions. Automatic fire detectors utilized for the purpose of performing fire safety functions shall be connected to the building's fire alarm control unit where a fire alarm system is required by Section 907.2. Detectors shall, upon actuation, perform the intended function and activate the alarm notification appliances or activate a visible and audible supervisory signal at a *constantly attended location*. In buildings not equipped with a fire alarm system, the automatic fire detector shall be powered by normal electrical service and, upon actuation, perform the intended function. The detectors shall be located in accordance with NFPA 72.

907.3.1 Duct smoke detectors. Smoke detectors installed in ducts shall be *listed* for the air velocity, temperature and humidity present in the duct. Duct smoke detectors shall be connected to the building's fire alarm control unit when a fire alarm system is required by Section 907.2. Activation of a duct smoke detector shall initiate a visible and audible supervisory signal at a *constantly attended location* and shall perform the intended fire safety function in accordance with this code and the *Mechanical Code*. In facilities that are required to be monitored by a supervising station, duct smoke detectors shall report only as a supervisory signal and not as a fire alarm. They shall not be used as a substitute for required open area detection.

Exceptions:

1. The supervisory signal at a *constantly attended location* is not required where duct smoke detectors activate the building's alarm notification appliances.
2. In occupancies not required to be equipped with a fire alarm system, actuation of a smoke detector shall activate a visible and an audible signal in an *approved* location. Smoke detector trouble conditions shall activate a visible or audible signal in an *approved* location and shall be identified as air duct detector trouble.

907.3.2 Delayed egress locks. Where delayed egress locks are installed on *means of egress* doors in accordance with Section 1010.1.9.7, an automatic smoke or heat

detection system shall be installed as required by that section.

907.3.3 Elevator emergency operation. Automatic fire detectors and all fire alarm system components installed for elevator emergency operation shall be installed in accordance with the provisions of ASME A17.1/CSA B44 and NFPA 72. Smoke detectors shall not be installed in unsprinklered elevator hoistways unless they are installed to activate the elevator hoistway smoke relief equipment.

907.3.4 Wiring. The wiring to the auxiliary devices and equipment used to accomplish the fire safety functions shall be monitored for integrity in accordance with NFPA 72.

907.4 Initiating devices. Where manual or automatic alarm initiation is required as part of a fire alarm system, the initiating devices shall be installed in accordance with Sections 907.4.1 through 907.4.3.1.

907.4.1 Protection of fire alarm control unit. In areas that are not continuously occupied, a single smoke detector shall be provided at the location of each fire alarm control unit, notification appliance circuit power extenders, and supervising station transmitting equipment.

Exception: Where ambient conditions prohibit installation of a smoke detector, a *heat detector* shall be permitted.

907.4.2 Manual fire alarm boxes. Where a manual fire alarm system is required by another section of this code, it shall be activated by fire alarm boxes installed in accordance with Sections 907.4.2.1 through 907.4.2.6.

907.4.2.1 Location. Manual fire alarm boxes shall be located not more than 5 feet (1524 mm) from the entrance to each *exit*. In buildings not protected by an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2, additional manual fire alarm boxes shall be located so that the *exit access* travel distance to the nearest box does not exceed 200 feet (60 960 mm).

907.4.2.2 Height. The height of the manual fire alarm boxes shall be not less than 42 inches (1067 mm) and not more than 48 inches (1372 mm) measured vertically, from the floor level to the activating handle or lever of the box.

907.4.2.3 Color. Manual fire alarm boxes shall be red in color.

907.4.2.4 Signs. Where fire alarm systems are not monitored by a supervising station, an *approved* permanent sign shall be installed adjacent to each manual fire alarm box that reads: WHEN ALARM SOUNDS CALL FIRE DEPARTMENT.

Exception: Where the manufacturer has permanently provided this information on the manual fire alarm box.

907.4.2.5 Protective covers. The *fire code* official is authorized to require the installation of *listed* manual fire alarm box protective covers to prevent malicious false alarms or to provide the manual fire alarm box

with protection from physical damage. The protective cover shall be transparent or red in color with a transparent face to permit visibility of the manual fire alarm box. Each cover shall include proper operating instructions. A protective cover that emits a local alarm signal shall not be installed unless *approved*. Protective covers shall not project more than that permitted by Section 1003.3.3.

907.4.2.6 Unobstructed and unobscured. Manual fire alarm boxes shall be accessible, unobstructed, unobscured and visible at all times.

907.4.3 Automatic smoke detection. Where an automatic smoke detection system is required it shall utilize smoke detectors unless ambient conditions prohibit such an installation. In spaces where smoke detectors cannot be utilized due to ambient conditions, *approved* automatic *heat detectors* shall be permitted.

907.4.3.1 Automatic sprinkler system. For conditions other than specific fire safety functions noted in Section 907.3, in areas where ambient conditions prohibit the installation of smoke detectors, an *automatic sprinkler system* installed in such areas in accordance with Section 903.3.1.1 or 903.3.1.2 and that is connected to the fire alarm system shall be *approved* as automatic heat detection.

907.5 Occupant notification systems. A fire alarm system shall annunciate at the fire alarm control unit and shall initiate occupant notification upon activation, in accordance with Sections 907.5.1 through 907.5.2.3.3. Where a fire alarm system is required by another section of this code, it shall be activated by:

1. Automatic fire detectors.
2. *Automatic sprinkler system* waterflow devices.
3. Manual fire alarm boxes.
4. Automatic fire-extinguishing systems.

Exception: Where notification systems are allowed elsewhere in Section 907 to annunciate at a *constantly attended location*.

907.5.1 Presignal feature. A presignal feature shall not be installed unless *approved* by the *fire code* official and the fire department. Where a presignal feature is provided, a signal shall be annunciated at a *constantly attended location approved* by the fire department so that occupant notification can be activated in the event of fire or other emergency.

907.5.2 Alarm notification appliances. Alarm notification appliances shall be provided and shall be *listed* for their purpose.

907.5.2.1 Audible alarms. Audible alarm notification appliances shall be provided and emit a distinctive sound that is not to be used for any purpose other than that of a fire alarm.

Exceptions:

1. Audible alarm notification appliances are not required in critical care areas of Group I-2

Condition 2 occupancies that are in compliance with Section 907.2.6, Exception 2.

2. A visible alarm notification appliance installed in a nurses' control station or other continuously attended staff location in a Group I-2 Condition 2 suite shall be an acceptable alternative to the installation of audible alarm notification appliances throughout the suite in Group I-2 Condition 2 occupancies that are in compliance with Section 907.2.6, Exception 2.
3. Where provided, audible notification appliances located in each occupant evacuation elevator lobby in accordance with Section 3008.9.1 shall be connected to a separate notification zone for manual paging only.

907.5.2.1.1 Average sound pressure. The audible alarm notification appliances shall provide a sound pressure level of 15 decibels (dBA) above the average ambient sound level or 5 dBA above the maximum sound level having a duration of not less than 60 seconds, whichever is greater, in every occupiable space within the building.

907.5.2.1.2 Maximum sound pressure. The maximum sound pressure level for audible alarm notification appliances shall be 110 dBA at the minimum hearing distance from the audible appliance. Where the average ambient noise is greater than 95 dBA, visible alarm notification appliances shall be provided in accordance with NFPA 72 and audible alarm notification appliances shall not be required.

907.5.2.2 Emergency voice/alarm communication systems. Emergency voice/alarm communication systems required by this code shall be designed and installed in accordance with NFPA 72. The operation of any automatic fire detector, sprinkler waterflow device or manual fire alarm box shall automatically sound an alert tone followed by voice instructions giving *approved* information and directions for a general or staged evacuation in accordance with the building's fire safety and evacuation plans required by Section 404 of the *Fire Code*. In high-rise buildings, the system shall operate on at least the alarming floor, the floor above and the floor below. Speakers shall be provided throughout the building by paging zones. At a minimum, paging zones shall be provided as follows:

1. Elevator groups.
2. *Interior exit stairways*.
3. Each floor.
4. *Areas of refuge* as defined in Chapter 2.

Exception: In Group I-1 and I-2 occupancies, the alarm shall sound in a constantly attended area and a general occupant notification shall be broadcast over the overhead page.

907.5.2.2.1 Manual override. A manual override for emergency voice communication shall be pro-

vided on a selective and all-call basis for all paging zones.

907.5.2.2.2 Live voice messages. The emergency voice/alarm communication system shall have the capability to broadcast live voice messages by paging zones on a selective and all-call basis.

907.5.2.2.3 Alternate uses. The emergency voice/alarm communication system shall be allowed to be used for other announcements, provided the manual fire alarm use takes precedence over any other use.

907.5.2.2.4 Emergency voice/alarm communication captions. Where stadiums, arenas and grandstands are required to caption audible public announcements in accordance with Section 1108.2.7.3, the emergency/voice alarm communication system shall be captioned. Prerecorded or live emergency captions shall be from an *approved* location constantly attended by personnel trained to respond to an emergency.

907.5.2.2.5 Emergency power. Emergency voice/alarm communications systems shall be provided with emergency power in accordance with Section 2702. The system shall be capable of powering the required load for a duration of not less than 24 hours, as required in NFPA 72.

907.5.2.3 Visible alarms. Visible alarm notification appliances shall be provided in accordance with Sections 907.5.2.3.1 through 907.5.2.3.3.

Exceptions:

1. Visible alarm notification appliances are not required in *alterations*, except where an existing fire alarm system is upgraded or replaced, or a new fire alarm system is installed.
2. Visible alarm notification appliances shall not be required in *exits* as defined in Chapter 2.
3. Visible alarm notification appliances shall not be required in elevator cars.
4. Visual alarm notification appliances are not required in critical care areas of Group I-2 Condition 2 occupancies that are in compliance with Section 907.2.6, Exception 2.

907.5.2.3.1 Public use areas and common use areas. Visible alarm notification appliances shall be provided in *public use areas* and *common use areas*.

Exception: Where employee work areas have audible alarm coverage, the notification appliance circuits serving the employee work areas shall be initially designed with not less than 20-percent spare capacity to account for the potential of adding visible notification appliances in the future to accommodate hearing-impaired employee(s).

907.5.2.3.2 Groups I-1 and R-1. Group I-1 and R-1 *dwelling units* or *sleeping units* in accordance with Table 907.5.2.3.2 shall be provided with a visible

alarm notification appliance, activated by both the in-room smoke alarm and the building fire alarm system.

**TABLE 907.5.2.3.2
VISIBLE ALARMS**

| NUMBER OF SLEEP UNITS | SLEEPING ACCOMMODATIONS WITH VISIBLE ALARMS |
|-----------------------|---|
| 6 to 25 | 2 |
| 26 to 50 | 4 |
| 51 to 75 | 7 |
| 76 to 100 | 9 |
| 101 to 150 | 12 |
| 151 to 200 | 14 |
| 201 to 300 | 17 |
| 301 to 400 | 20 |
| 401 to 500 | 22 |
| 501 to 1,000 | 5% of total |
| 1,001 and over | 50 plus 3 for each 100 over 1,000 |

907.5.2.3.3 Group R-2. In Group R-2 occupancies required by Section 907 to have a fire alarm system, all *dwelling units* and *sleeping units* shall be provided with the capability to support visible alarm notification appliances in accordance with Chapter 10 of ICC A117.1. Such capability shall be permitted to include the potential for future interconnection of the building fire alarm system with the unit smoke alarms, replacement of audible appliances with combination audible/visible appliances, or future extension of the existing wiring from the unit smoke alarm locations to required locations for visible appliances.

907.6 Installation and monitoring. A fire alarm system shall be installed and monitored in accordance with Sections 907.6.1 through 907.6.6.2 and NFPA 72.

907.6.1 Wiring. Wiring shall comply with the requirements of NFPA 70 and NFPA 72. Wireless protection systems utilizing radio-frequency transmitting devices shall comply with the special requirements for supervision of low-power wireless systems in NFPA 72.

907.6.2 Power supply. The primary and secondary power supply for the fire alarm system shall be provided in accordance with NFPA 72.

Exception: Back-up power for single-station and multiple-station smoke alarms as required in Section 907.2.11.6.

907.6.3 Initiating device identification. The fire alarm system shall identify the specific initiating device address, location, device type, floor level where applicable and status including indication of normal, alarm, trouble and supervisory status, as appropriate.

Exceptions:

1. Fire alarm systems in single-story buildings less than 22,500 square feet (2090 m²) in area.

2. Fire alarm systems that only include manual fire alarm boxes, waterflow initiating devices and not more than 10 additional alarm-initiating devices.
3. Special initiating devices that do not support individual device identification.
4. Fire alarm systems or devices that are replacing existing equipment.

907.6.3.1 Annunciation. The initiating device status shall be annunciated at an *approved* on-site location.

907.6.4 Zones. Each floor shall be zoned separately and a zone shall not exceed 22,500 square feet (2090 m²). The length of any zone shall not exceed 300 feet (91 440 mm) in any direction.

Exception: *Automatic sprinkler system* zones shall not exceed the area permitted by NFPA 13.

907.6.4.1 Zoning indicator panel. A zoning indicator panel and the associated controls shall be provided in an *approved* location that is readily discernible and readily accessible to the responding fire department. The visual zone indication shall lock in until the system is reset and shall not be canceled by the operation of an audible alarm-silencing switch. Zoning indicator panels shall include remote annunciator panels and zoning displays that are integral to the fire alarm control equipment.

907.6.4.1.1 Remote annunciator panels. Where remote annunciator panels are required, they shall be provided at the main entrance, at each designated fire department entrance, and where specified by Section 907.6.4.1.1.2. Remote annunciator panels shall be provided as follows:

907.6.4.1.1.1 Directory-style display. A directory-style annunciator shall be provided in buildings more than one story above or below grade and in buildings with more than one zone per floor. The directory-style annunciator shall consist of either an alpha-numeric LCD display or an *approved* directory-style panel with individual lamps. As a minimum, the annunciator shall indicate related floor, zone and status conditions using readily identifiable designations in plain English text.

Exception: Where a graphic display with individual lamps is provided in accordance with Section 907.6.4.1.1.2.1.

907.6.4.1.1.2 Graphic display. A graphic annunciator display shall be provided at the main entrance, and in the fire command center or at the fire alarm control panel location where there is no fire command center, for buildings of the following types:

1. *High-rise buildings.*
2. Covered mall buildings.
3. Nursing homes and hospitals.

4. Buildings of any occupancy where three or more exits are provided per floor level above or below the level of exit discharge.
5. Buildings comprised of more than one street address with separate entrances.
6. Buildings with Group A occupancies of greater than 1000 persons.

907.6.4.1.1.2.1 Graphic display features. Graphic annunciator displays shall consist of an integrated graphic annunciator panel, or where *approved* in buildings not more than four stories above or two stories below the fire department entrance, a directory-style annunciator panel with a permanently mounted graphic diagram. Graphic annunciator displays shall be fabricated of a durable material and shall incorporate the following features:

1. A graphic diagram that identifies:
 - 1.1. Building address.
 - 1.2. North arrow.
 - 1.3. Building floor plan outline of each general type, where the orientation of each diagram is consistent with the annunciator location.
 - 1.4. Fire alarm zoning.
 - 1.5. Location of exit stairways, labeled with designations that are consistent with Section 1023.9 and labeled to indicate stairways that provide roof access.
 - 1.6. Location of elevator banks.
 - 1.7. Location of elevator machine room.
 - 1.8. Location of the annunciator with "YOU ARE HERE" marker.
 - 1.9. Location of fire command center or fire alarm control equipment.
 - 1.10. Location of fire department connections.
 2. Individual lamps that identify each associated device, floor, zone and system status condition. Lamp colors shall be coordinated with the associated system conditions as follows: red for alarm, yellow or amber for supervisory, and yellow or amber for system trouble. Green lamps shall be permitted to indicate annunciator power supervision. A push-button style switch shall be provided for lamp test operation.
 3. Audible alert sounder that locally annunciates alarm, trouble, and supervisory conditions with an alert silencing-switch that is accessible to authorized personnel only.
- Exception:** An audible sounder is not required for an annunciator panel where the

required audible annunciation is provided by fire alarm control equipment that is located adjacent to the annunciator.

907.6.4.2 High-rise buildings. In high-rise buildings, a separate zone by floor shall be provided for each of the following types of alarm-initiating devices where provided:

1. Smoke detectors.
2. Sprinkler waterflow devices.
3. Manual fire alarm boxes.
4. Other *approved* types of automatic fire detection devices or suppression systems.

907.6.5 Access. Access shall be provided to each fire alarm device and notification appliance for periodic inspection, maintenance and testing.

907.6.6 Monitoring. Fire alarm systems required by this chapter or by the *Fire Code* shall be monitored by an *approved* supervising station in accordance with NFPA 72.

Exception: Monitoring by a supervising station is not required for:

1. Single- and multiple-station smoke alarms required by Section 907.2.11.
2. Smoke detectors in Group I-3 occupancies.
3. *Automatic sprinkler systems* in one- and two-family dwellings.

907.6.6.1 Automatic telephone-dialing devices. Automatic telephone-dialing devices used to transmit an emergency alarm shall not be connected to any fire department telephone number unless *approved* by the fire chief.

907.6.6.2 Termination of monitoring service. Termination of fire alarm monitoring services shall be in accordance with Section 901.9 of the *Fire Code*.

907.7 Acceptance tests and completion. Upon completion of the installation, the fire alarm system and all fire alarm components shall be tested in accordance with NFPA 72.

907.7.1 Single- and multiple-station alarm devices. When the installation of the alarm devices is complete, each device and interconnecting wiring for multiple-station alarm devices shall be tested in accordance with the smoke alarm provisions of NFPA 72.

907.7.2 Record of completion. A record of completion in accordance with NFPA 72 verifying that the system has been installed and tested in accordance with the *approved* plans and specifications shall be provided.

907.7.3 Instructions. Operating, testing and maintenance instructions and record drawings (“as-builts”) and equipment specifications shall be provided at an *approved* location.

907.8 Inspection, testing and maintenance. The maintenance and testing schedules and procedures for fire alarm and fire detection systems shall be in accordance with Section 907.8 of the *Fire Code*.

SECTION 908 EMERGENCY ALARM SYSTEMS

908.1 General. The systems required by this section shall be designed and installed in accordance with the provisions of both this code and the *Fire Code*. Before proceeding with design, construction, installation, or use of systems required by Sections 908.2 through 908.6, the *owner* shall request and participate in a coordination meeting with DCRA and the Fire Department to determine the applicable code requirements. The meeting shall be attended by all concerned parties, including, but not limited to, the *owner*, contractor, architect and design professionals.

908.2 Group H occupancies. Emergency alarms for the detection and notification of an emergency condition in Group H occupancies shall be provided in accordance with Section 415.5. Emergency alarms for notification of an emergency condition in an HPM facility shall be provided as required in Section 415.11.3.5. A continuous gas-detection system shall be provided for HPM gases in accordance with Section 415.11.7.

908.3 Highly toxic and toxic materials. A gas detection system shall be provided to detect the presence of *highly toxic* or *toxic* gas at or below the permissible exposure limit (PEL) or ceiling limit of the gas for which detection is provided. The system shall be capable of monitoring the discharge from the treatment system at or below one-half the immediately dangerous to life and health (IDLH) limit.

Exception: A gas detection system is not required for *toxic* gases when the physiological warning threshold level for the gas is at a level below the accepted PEL for the gas.

908.3.1 Alarms. The gas detection system shall initiate a local alarm and transmit a signal to a constantly attended control station when a short-term hazard condition is detected. The alarm shall be both visible and audible and shall provide warning both inside and outside the area where gas is detected. The audible alarm shall be distinct from all other alarms.

Exception: Signal transmission to a constantly attended control station is not required when not more than one cylinder of *highly toxic* or *toxic* gas is stored.

908.3.2 Shutoff of gas supply. The gas detection system shall automatically close the shutoff valve at the source on gas supply piping and tubing related to the system being monitored for whichever gas is detected.

Exception: Automatic shutdown is not required for reactors utilized for the production of *highly toxic* or *toxic* compressed gases where such reactors are:

1. Operated at pressures less than 15 pounds per square inch gauge (psig) (103.4 kPa).
2. Constantly attended.
3. Provided with readily accessible emergency shutoff valves.

908.3.3 Valve closure. The automatic closure of shutoff valves shall be in accordance with the following:

1. When the gas-detection sampling point initiating the gas detection system alarm is within a gas cabinet or

exhausted enclosure, the shutoff valve in the gas cabinet or exhausted enclosure for the specific gas detected shall automatically close.

2. Where the gas-detection sampling point initiating the gas detection system alarm is within a gas room and compressed gas containers are not in gas cabinets or exhausted enclosures, the shutoff valves on all gas lines for the specific gas detected shall automatically close.
3. Where the gas-detection sampling point initiating the gas detection system alarm is within a piping distribution manifold enclosure, the shutoff valve for the compressed container of specific gas detected supplying the manifold shall automatically close.

Exception: When the gas-detection sampling point initiating the gas detection system alarm is at a use location or within a gas valve enclosure of a branch line downstream of a piping distribution manifold, the shutoff valve in the gas valve enclosure for the branch line located in the piping distribution manifold enclosure shall automatically close.

908.4 Ozone gas-generator rooms. Ozone gas-generator rooms shall be equipped with a continuous gas detection system that will shut off the generator and sound a local alarm when concentrations above the PEL occur.

908.5 Repair garages. A flammable-gas detection system shall be provided in repair garages for vehicles fueled by non-odorized gases in accordance with Section 406.8.5.

908.6 Refrigerant detector. Machinery rooms shall contain a refrigerant detector with an audible and visual alarm. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant from a leak will concentrate. The alarm shall be actuated at a value not greater than the corresponding TLV-TWA values for the refrigerant classification shown in the *Mechanical Code* for the refrigerant classification. Detectors and alarms shall be placed in *approved* locations. The detector shall transmit a signal to an *approved* location.

908.7 Carbon dioxide (CO₂) systems. Emergency alarm systems in accordance with Section 5307.5.2 of the *Fire Code* shall be provided where required for compliance with Section 5307.5 of the *Fire Code*.

SECTION 909 SMOKE CONTROL SYSTEMS

909.1 Scope and purpose. This section applies to mechanical or passive smoke control systems where they are required by other provisions of this code. The purpose of this section is to establish minimum requirements for the design, installation and acceptance testing of smoke control systems that are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of contents, the timely restoration of operations or for assistance in fire suppression or overhaul activities. Smoke control systems regulated by this section

serve a different purpose than the smoke- and heat-venting provisions found in Section 910. Mechanical smoke control systems shall not be considered exhaust systems under Chapter 5 of the *Mechanical Code*.

909.2 General design requirements. Buildings, structures or parts thereof required by this code to have a smoke control system or systems shall have such systems designed in accordance with the applicable requirements of Section 909 and the generally accepted and well-established principles of engineering relevant to the design. The *construction documents* shall include sufficient information and detail to adequately describe the elements of the design necessary for the proper implementation of the smoke control systems. These documents shall be accompanied by sufficient information and analysis to demonstrate compliance with these provisions.

909.3 Special inspection and test requirements. In addition to the ordinary inspection and test requirements that buildings, structures and parts thereof are required to undergo, smoke control systems subject to the provisions of Section 909 shall undergo *special inspections* and tests sufficient to verify the proper commissioning of the smoke control design in its final installed condition. The design submission accompanying the *construction documents* shall clearly detail procedures and methods to be used and the items subject to such inspections and tests. Such commissioning shall be in accordance with generally accepted engineering practice and, where possible, based on published standards for the particular testing involved. The special inspections and tests required by this section shall be conducted under the same terms in Section 1704.

909.4 Analysis. A rational analysis supporting the types of smoke control systems to be employed, their methods of operation, the systems supporting them and the methods of construction to be utilized shall accompany the submitted *construction documents* and shall include, but not be limited to, the items indicated in Sections 909.4.1 through 909.4.7.

909.4.1 Stack effect. The system shall be designed such that the maximum probable normal or reverse stack effect will not adversely interfere with the system's capabilities. In determining the maximum probable stack effect, altitude, elevation, weather history and interior temperatures shall be used.

909.4.2 Temperature effect of fire. Buoyancy and expansion caused by the design fire in accordance with Section 909.9 shall be analyzed. The system shall be designed such that these effects do not adversely interfere with the system's capabilities.

909.4.3 Wind effect. The design shall consider the adverse effects of wind. Such consideration shall be consistent with the wind-loading provisions of Chapter 16.

909.4.4 HVAC systems. The design shall consider the effects of the heating, ventilating and air-conditioning (HVAC) systems on both smoke and fire transport. The analysis shall include all permutations of systems status. The design shall consider the effects of the fire on the HVAC systems.

909.4.5 Climate. The design shall consider the effects of low temperatures on systems, property and occupants. Air inlets and exhausts shall be located so as to prevent snow or ice blockage.

909.4.6 Duration of operation. All portions of active or engineered smoke control systems shall be capable of continued operation after detection of the fire event for a period of not less than either 20 minutes or 1.5 times the calculated egress time, whichever is greater.

909.4.7 Smoke control system interaction. The design shall consider the interaction effects of the operation of multiple smoke control systems for all design scenarios.

909.5 Smoke barrier construction. *Smoke barriers* required for passive smoke control and a smoke control system using the pressurization method shall comply with Section 709. The maximum allowable leakage area shall be the aggregate area calculated using the following leakage area ratios:

1. Walls $A/A_w = 0.00100$
2. Interior *exit stairways* and *ramps* and *exit passageways*: $A/A_w = 0.00035$
3. Enclosed *exit access stairways* and *ramps* and all other shafts: $A/A_w = 0.00150$
4. Floors and roofs: $A/A_F = 0.00050$

where:

A = Total leakage area, square feet (m^2).

A_F = Unit floor or roof area of barrier, square feet (m^2).

A_w = Unit wall area of barrier, square feet (m^2).

The leakage area ratios shown do not include openings due to gaps around doors and operable windows. The total leakage area of the *smoke barrier* shall be determined in accordance with Section 909.5.1 and tested in accordance with Section 909.5.2.

909.5.1 Total leakage area. Total leakage area of the barrier is the product of the *smoke barrier* gross area multiplied by the allowable leakage area ratio, plus the area of other openings such as gaps around doors and operable windows.

909.5.2 Testing of leakage area. Compliance with the maximum total leakage area shall be determined by achieving the minimum air pressure difference across the barrier with the system in the smoke control mode for mechanical smoke control systems utilizing the pressurization method. Compliance with the maximum total leakage area of passive smoke control systems shall be verified through methods such as door fan testing or other methods, as *approved* by the *fire code* official.

909.5.3 Opening protection. Openings in *smoke barriers* shall be protected by automatic-closing devices actuated by the required controls for the mechanical smoke control system. Door openings shall be protected by *fire door assemblies* complying with Section 716.5.3.

Exceptions:

1. Passive smoke control systems with automatic-closing devices actuated by spot-type smoke

detectors *listed* for releasing service installed in accordance with Section 907.3.

2. Fixed openings between smoke zones that are protected utilizing the airflow method.
3. In Group I-1 Condition 2, Group I-2 and ambulatory care facilities, where a pair of opposite-swinging doors are installed across a corridor in accordance with Section 909.5.3.1, the doors shall not be required to be protected in accordance with Section 716. The doors shall be close-fitting within operational tolerances and shall not have a center mullion or undercuts in excess of $3/4$ inch (19.1 mm), louvers or grilles. The doors shall have head and jamb stops and astragals or rabbets at meeting edges and, where permitted by the door manufacturer's listing, positive-latching devices are not required.
4. In Group I-2 and ambulatory care facilities, where such doors are special-purpose horizontal sliding, accordion or folding door assemblies installed in accordance with Section 1010.1.4.3 and are automatic closing by smoke detection in accordance with Section 716.5.9.3.
5. Group I-3.
6. Openings between smoke zones with clear ceiling heights of 14 feet (4267 mm) or greater and bank-down capacity of greater than 20 minutes as determined by the design fire size.

909.5.3.1 Group I-1 Condition 2; Group I-2 and ambulatory care facilities. In Group I-1 Condition 2, Group I-2 and *ambulatory care facilities*, where doors are installed across a *corridor*, the doors shall be automatic closing by smoke detection in accordance with Section 716.5.9.3 and shall have a vision panel with fire protection-rated glazing materials in fire protection-rated frames, the area of which shall not exceed that tested.

909.5.3.2 Ducts and air transfer openings. Ducts and air transfer openings are required to be protected with a minimum Class II, 250°F (121°C) *smoke damper* complying with Section 717.

909.6 Pressurization method. The primary mechanical means of controlling smoke shall be by pressure differences across smoke barriers. Maintenance of a tenable environment is not required in the smoke control zone of fire origin.

909.6.1 Minimum pressure difference. The minimum pressure difference across a *smoke barrier* shall be 0.05-inch water gage (0.0124 kPa) in fully sprinklered buildings.

In buildings permitted to be other than fully sprinklered, the smoke control system shall be designed to achieve pressure differences not less than two times the maximum calculated pressure difference produced by the design fire.

909.6.2 Maximum pressure difference. The maximum air pressure difference across a *smoke barrier* shall be

determined by required door-opening or closing forces. The actual force required to open *exit* doors when the system is in the smoke control mode shall be in accordance with Section 1010.1.3. Opening and closing forces for other doors shall be determined by standard engineering methods for the resolution of forces and reactions. The calculated force to set a side-hinged, swinging door in motion shall be determined by:

$$F = F_{dc} + K(WA\Delta P)/2(W-d) \quad (\text{Equation 9-1})$$

where:

A = Door area, square feet (m^2).

d = Distance from door handle to latch edge of door, feet (m).

F = Total door opening force, pounds (N).

F_{dc} = Force required to overcome closing device, pounds (N).

K = Coefficient 5.2 (1.0).

W = Door width, feet (m).

ΔP = Design pressure difference, inches of water (Pa).

909.6.3 Pressurized stairways and elevator hoistways. Where stairways or elevator hoistways are pressurized, such pressurization systems shall comply with Section 909 as smoke control systems, in addition to the requirements of Sections 909.20 of this code and 909.21 of the *Fire Code*.

909.7 Airflow design method. Where *approved* by the *fire code* official, smoke migration through openings fixed in a permanently open position, which are located between smoke control zones by the use of the airflow method, shall be permitted. The design airflow shall be in accordance with this section. Airflow shall be directed to limit smoke migration from the fire zone. The geometry of openings shall be considered to prevent flow reversal from turbulent effects. Smoke control systems using the airflow method shall be designed in accordance with NFPA 92.

909.7.1 Prohibited conditions. This method shall not be employed where either the quantity of air or the velocity of the airflow will adversely affect other portions of the smoke control system, unduly intensify the fire, disrupt plume dynamics or interfere with exiting. In no case shall airflow toward the fire exceed 200 feet per minute (1.02 m/s). Where the calculated airflow exceeds this limit, the airflow method shall not be used.

909.8 Exhaust method. Where *approved* by the *fire code* official, mechanical smoke control for large enclosed volumes, such as in atriums or malls, shall be permitted to utilize the exhaust method. Smoke control systems using the exhaust method shall be designed in accordance with NFPA 92.

909.8.1 Smoke layer. The height of the lowest horizontal surface of the smoke layer interface shall be maintained not less than 6 feet (1829 mm) above a walking surface that forms a portion of a required egress system within the smoke zone.

909.9 Design fire. The design fire shall be based on a rational analysis performed by the *registered design professional* and

approved by the *fire code* official. The design fire shall be based on the analysis in accordance with Section 909.4 and this section.

909.9.1 Factors considered. The engineering analysis shall include the characteristics of the fuel, fuel load, effects included by the fire and whether the fire is likely to be steady or unsteady.

909.9.2 Design fire fuel. Determination of the design fire shall include consideration of the type of fuel, fuel spacing and configuration.

909.9.3 Heat-release assumptions. The analysis shall make use of best available data from *approved* sources and shall not be based on excessively stringent limitations of combustible material.

909.9.4 Sprinkler effectiveness assumptions. A documented engineering analysis shall be provided for conditions that assume fire growth is halted at the time of sprinkler activation.

909.10 Equipment. Equipment including, but not limited to, fans, ducts, automatic *dampers* and balance *dampers*, shall be suitable for its intended use, suitable for the probable exposure temperatures that the rational analysis indicates and as *approved* by the *fire code* official.

909.10.1 Exhaust fans. Components of exhaust fans shall be rated and certified by the manufacturer for the probable temperature rise to which the components will be exposed. This temperature rise shall be computed by:

$$T_s = (Q_c/mc) + (T_a) \quad (\text{Equation 9-2})$$

where:

c = Specific heat of smoke at smoke layer temperature, Btu/lb°F (kJ/kg · K).

m = Exhaust rate, pounds per second (kg/s).

Q_c = Convective heat output of fire, Btu/s (kW).

T_a = Ambient temperature, °F (K).

T_s = Smoke temperature, °F (K).

Exception: Reduced T_s as calculated based on the assurance of adequate dilution air.

909.10.2 Ducts. Duct materials and joints shall be capable of withstanding the probable temperatures and pressures to which they are exposed as determined in accordance with Section 909.10.1. Ducts shall be constructed and supported in accordance with the *Mechanical Code*. Ducts shall be leak tested to 1.5 times the maximum design pressure in accordance with nationally accepted practices. Measured leakage shall not exceed 5 percent of design flow. Results of such testing shall be a part of the documentation procedure. Ducts shall be supported directly from fire-resistance-rated structural elements of the building by substantial, noncombustible supports.

Exception: Flexible connections, for the purpose of vibration isolation, complying with the *Mechanical Code* and that are constructed of *approved* fire-resistance-rated materials.

909.10.3 Equipment, inlets and outlets. Equipment shall be located so as to not expose uninvolved portions of the building to an additional fire hazard. Outside air inlets shall be located so as to minimize the potential for introducing smoke or flame into the building. Exhaust outlets shall be so located as to minimize reintroduction of smoke into the building and to limit exposure of the building or adjacent buildings to an additional fire hazard.

909.10.4 Automatic dampers. Automatic dampers, regardless of the purpose for which they are installed within the smoke control system, shall be *listed* and conform to the requirements of *approved*, recognized standards.

909.10.5 Fans. In addition to other requirements, belt-driven fans shall have 1.5 times the number of belts required for the design duty, with the minimum number of belts being two. Fans shall be selected for stable performance based on normal temperature and, where applicable, elevated temperature. Calculations and manufacturer's fan curves shall be part of the documentation procedures. Fans shall be supported and restrained by noncombustible devices in accordance with the requirements of Chapter 16.

Motors driving fans shall not be operated beyond their nameplate horsepower (kilowatts), as determined from measurement of actual current draw, and shall have a minimum service factor of 1.15.

909.11 Standby power. Smoke control systems shall be provided with standby power in accordance with Section 2702.

909.11.1 Equipment room. The standby power source and its transfer switches shall be in a room separate from the normal power transformers and switch gears and ventilated directly to and from the exterior. The room shall be enclosed with not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

909.11.2 Power sources and power surges. Elements of the smoke control system relying on volatile memories or the like shall be supplied with uninterruptable power sources of sufficient duration to span 15-minute primary power interruption. Elements of the smoke control system susceptible to power surges shall be suitably protected by conditioners, suppressors or other *approved* means.

909.12 Detection and control systems. Fire detection systems providing control input or output signals to mechanical smoke control systems or elements thereof shall comply with the requirements of Section 907. Such systems shall be equipped with a control unit complying with UL 864 and *listed* as smoke control equipment.

909.12.1 Verification. Control systems for mechanical smoke control systems shall include provisions for verification. Verification shall include positive confirmation of actuation, testing, manual override and the presence of power downstream of all disconnects. A preprogrammed

weekly test sequence shall report abnormal conditions audibly, visually and by printed report. The preprogrammed weekly test shall operate all devices, equipment and components used for smoke control.

Exception: Where verification of individual components tested through the preprogrammed weekly testing sequence will interfere with, and produce unwanted effects to, normal building operation, such individual components are permitted to be bypassed from the preprogrammed weekly testing, where *approved* by the building official and in accordance with both of the following:

1. Where the operation of components is bypassed from the preprogrammed weekly test, presence of power downstream of all disconnects shall be verified weekly by a listed control unit.
2. Testing of all components bypassed from the preprogrammed weekly test shall be in accordance with Section 909.20.6 of the *Fire Code*.

909.12.2 Wiring. In addition to meeting requirements of NFPA 70, all wiring, regardless of voltage, shall be fully enclosed within continuous raceways.

909.12.3 Activation. Smoke control systems shall be activated in accordance with this section.

909.12.3.1 Pressurization, airflow or exhaust method. Mechanical smoke control systems using the pressurization, airflow or exhaust method shall have completely automatic control.

909.12.3.2 Passive method. Passive smoke control systems actuated by *approved* spot-type detectors *listed* for releasing service shall be permitted.

909.12.4 Automatic control. Where completely automatic control is required or used, the automatic-control sequences shall be initiated from an appropriately zoned *automatic sprinkler system* complying with Section 903.3.1.1, manual controls that are readily accessible to the fire department and any smoke detectors required by engineering analysis.

909.13 Control air tubing. Control air tubing shall be of sufficient size to meet the required response times. Tubing shall be flushed clean and dry prior to final connections and shall be adequately supported and protected from damage. Tubing passing through concrete or masonry shall be sleeved and protected from abrasion and electrolytic action.

909.13.1 Materials. Control-air tubing shall be hard-drawn copper, Type L, ACR in accordance with ASTM B42, ASTM B43, ASTM B68, ASTM B88, ASTM B251 and ASTM B280. Fittings shall be wrought copper or brass, solder type in accordance with ASME B16.18 or ASME B16.22. Changes in direction shall be made with appropriate tool bends. Brass compression-type fittings shall be used at final connection to devices; other joints shall be brazed using a BCuP-5 brazing alloy with solidus above 1,100°F (593°C) and liquids below 1,500°F

(816°C). Brazing flux shall be used on copper-to-brass joints only.

Exception: Nonmetallic tubing used within control panels and at the final connection to devices provided all of the following conditions are met:

1. Tubing shall comply with the requirements of Section 602.2.1.3 of the *Mechanical Code*.
2. Tubing and connected devices shall be completely enclosed within a galvanized or paint-grade steel enclosure having a minimum thickness of 0.0296 inch (0.7534 mm) (No. 22 gage). Entry to the enclosure shall be by copper tubing with a protective grommet of neoprene or Teflon or by suitable brass compression to male barbed adapter.
3. Tubing shall be identified by appropriately documented coding.
4. Tubing shall be neatly tied and supported within the enclosure. Tubing bridging cabinets and doors or moveable devices shall be of sufficient length to avoid tension and excessive stress. Tubing shall be protected against abrasion. Tubing serving devices on doors shall be fastened along hinges.

909.13.2 Isolation from other functions. Control tubing serving other than smoke control functions shall be isolated by automatic isolation valves or shall be an independent system.

909.13.3 Testing. Control air tubing shall be tested at three times the operating pressure for not less than 30 minutes without any noticeable loss in gauge pressure prior to final connection to devices.

909.14 Marking and identification. The detection and control systems shall be clearly marked at all junctions, accesses and terminations.

909.15 Control diagrams. Identical control diagrams showing all devices in the system and identifying their location and function shall be maintained current and kept on file with the *fire code* official, the fire department and in the fire command center in a format and manner *approved* by the fire chief.

909.16 Fire fighter's smoke control panel. A fire fighter's smoke control panel for fire department emergency response purposes only shall be provided and shall include manual control or override of automatic control for mechanical smoke systems. The panel shall be located in a fire command center complying with Section 911 in high-rise buildings or buildings with smoke-protected assembly seating. In all other buildings, the fire fighter's smoke control panel shall be installed in an *approved* location adjacent to the fire alarm control panel. The fire fighter's smoke control panel shall comply with Sections 909.16.1 through 909.16.3.

Exception: Where buildings are equipped with stair pressurization systems and/or elevator hoistway venting systems and no mechanical smoke control systems in accordance with Section 909, the required manual controls

are permitted to be integral to the fire alarm control panel or located at another *approved* location and are not required to comply with the provisions of Section 909.16.

909.16.1 Smoke control systems. Fans within the building shall be shown on the fire fighter's control panel. A clear indication of the direction of airflow and the relationship of components shall be displayed. Status indicators shall be provided for all smoke control equipment, annunciated by fan and zone, and by pilot-lamp-type indicators as follows:

1. Fans, *dampers* and other operating equipment in their normal status—WHITE.
2. Fans, *dampers* and other operating equipment in their off or closed status—RED.
3. Fans, *dampers* and other operating equipment in their on or open status—GREEN.
4. Fans, *dampers* and other operating equipment in a fault status—YELLOW/AMBER.

909.16.2 Smoke control panel. The fire fighter's control panel shall provide control capability over the complete smoke control system equipment within the building as follows:

1. ON-AUTO-OFF control over each individual piece of operating smoke control equipment that can also be controlled from other sources within the building. This includes *stairway* pressurization fans; smoke exhaust fans; supply, return and exhaust fans; elevator shaft fans and other operating equipment used or intended for smoke control purposes.
2. OPEN-AUTO-CLOSE control over individual *dampers* relating to smoke control and that are also controlled from other sources within the building.
3. ON-OFF or OPEN-CLOSE control over smoke control and other critical equipment associated with a fire or smoke emergency and that can only be controlled from the fire fighter's control panel.

Exceptions:

1. Complex systems, where *approved*, where the controls and indicators are combined to control and indicate all elements of a single smoke zone as a unit.
2. Complex systems, where *approved*, where the control is accomplished by computer interface using *approved*, plain English commands.

909.16.3 Control action and priorities. The fire-fighter's control panel actions shall be as follows:

1. ON-OFF and OPEN-CLOSE control actions shall have the highest priority of any control point within the building. Once issued from the fire fighter's control panel, automatic or manual control from any other control point within the building shall not contradict the control action. Where automatic means are provided to interrupt normal, nonemergency equipment operation or produce a specific result to safeguard the building or equipment including, but

not limited to, duct freezestats, duct smoke detectors, high-temperature cutouts, temperature-actuated linkage and similar devices, such means shall be capable of being overridden by the fire fighter's control panel. The last control action as indicated by each fire fighter's control panel switch position shall prevail. Control actions shall not require the smoke control system to assume more than one configuration at any one time.

Exception: Power disconnects required by NFPA 70.

2. Only the AUTO position of each three-position fire-fighter's control panel switch shall allow automatic or manual control action from other control points within the building. The AUTO position shall be the NORMAL, nonemergency, building control position. Where a fire fighter's control panel is in the AUTO position, the actual status of the device (on, off, open, closed) shall continue to be indicated by the status indicator described in Section 909.16.1. Where directed by an automatic signal to assume an emergency condition, the NORMAL position shall become the emergency condition for that device or group of devices within the zone. Control actions shall not require the smoke control system to assume more than one configuration at any one time.

909.17 System response time. Smoke-control system activation shall be initiated immediately after receipt of an appropriate automatic or manual activation command. Smoke control systems shall activate individual components (such as *dampers* and fans) in the sequence necessary to prevent physical damage to the fans, *dampers*, ducts and other equipment. For purposes of smoke control, the fire fighter's control panel response time shall be the same for automatic or manual smoke control action initiated from any other building control point. The total response time, including that necessary for detection, shutdown of operating equipment and smoke control system startup, shall allow for full operational mode to be achieved before the conditions in the space exceed the design smoke condition. The system response time for each component and their sequential relationships shall be detailed in the required rational analysis and verification of their installed condition reported in the required final report.

909.18 Acceptance testing. Devices, equipment, components and sequences shall be individually tested. These tests, in addition to those required by other provisions of this code, shall consist of determination of function, sequence and, where applicable, capacity of their installed condition.

909.18.1 Detection devices. Smoke or fire detectors that are a part of a smoke control system shall be tested in accordance with Chapter 9 in their installed condition. Where applicable, this testing shall include verification of airflow in both minimum and maximum conditions.

909.18.2 Ducts. Ducts that are part of a smoke control system shall be traversed using generally accepted practices to determine actual air quantities.

909.18.3 Dampers. *Dampers* shall be tested for function in their installed condition.

909.18.4 Inlets and outlets. Inlets and outlets shall be read using generally accepted practices to determine air quantities.

909.18.5 Fans. Fans shall be examined for correct rotation. Measurements of voltage, amperage, revolutions per minute (rpm) and belt tension shall be made.

909.18.6 Smoke barriers. Measurements using inclined manometers or other *approved* calibrated measuring devices shall be made of the pressure differences across *smoke barriers*. Such measurements shall be conducted for each possible smoke control condition.

909.18.7 Controls. Each smoke zone equipped with an automatic-initiation device shall be put into operation by the actuation of one such device. Each additional device within the zone shall be verified to cause the same sequence without requiring the operation of fan motors in order to prevent damage. Control sequences shall be verified throughout the system, including verification of override from the fire-fighter's control panel and simulation of standby power conditions.

909.18.8 Testing for smoke control. Smoke control systems shall be tested by a special inspector in accordance with Section 1705.18.

909.18.8.1 Scope of testing. Testing shall be conducted in accordance with the following:

1. During erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location.
2. Prior to occupancy and after sufficient completion for the purposes of pressure-difference testing, flow measurements, and detection and control verification.

909.18.8.2 Qualifications. *Approved* agencies for smoke control testing shall have expertise in fire protection engineering, mechanical engineering and certification as air balancers.

909.18.8.3 Reports. A complete report of testing shall be prepared by the *approved* agency. The report shall include identification of all devices by manufacturer, nameplate data, design values, measured values and identification tag or *mark*. The report shall be reviewed by the responsible *registered design professional* and, when satisfied that the design intent has been achieved, the responsible *registered design professional* shall sign, seal and date the report.

909.18.8.3.1 Report filing. A copy of the final report shall be filed with the *fire code* official and an identical copy shall be maintained in an *approved* location at the building.

909.18.9 Identification and documentation. Charts, drawings and other documents identifying and locating each component of the smoke control system, and describing its proper function and maintenance requirements, shall be maintained on file at the building as an attachment to the report required by Section 909.18.8.3. Devices shall have an *approved* identifying tag or *mark* on them consis-

tent with the other required documentation and shall be dated indicating the last time they were successfully tested and by whom.

909.19 System acceptance. Buildings, or portions thereof, required by this code to comply with this section shall not be issued a certificate of occupancy until such time that the *fire code* official determines that the provisions of this section have been fully complied with and that the fire department has received satisfactory instruction on the operation, both automatic and manual, of the system and a written maintenance program complying with the requirements of Section 909.20.1 of the *Fire Code* has been submitted and approved by the *fire code* official.

Exception: In buildings of phased construction, a temporary certificate of occupancy, as *approved* by the *fire code* official, shall be allowed provided that those portions of the building to be occupied meet the requirements of this section and that the remainder does not pose a significant hazard to the safety of the proposed occupants or adjacent buildings.

909.20 Smokeproof enclosures. Where required by Section 1023.11, a smokeproof enclosure shall be constructed in accordance with this section. A smokeproof enclosure shall consist of an *interior exit stairway* or *ramp* that is enclosed in accordance with the applicable provisions of Section 1023 and an open exterior balcony or ventilated vestibule meeting the requirements of this section. Where access to the roof is required by the *Fire Code*, such access shall be from the smokeproof enclosure where a smokeproof enclosure is required.

909.20.1 Access. Access to the *stairway* or *ramp* shall be by way of a vestibule or an open exterior balcony. The minimum dimension of the vestibule shall be not less than the required width of the *corridor* leading to the vestibule but shall not have a width of less than 44 inches (1118 mm) and shall not have a length of less than 72 inches (1829 mm) in the direction of egress travel.

909.20.2 Construction. The smokeproof enclosure shall be separated from the remainder of the building by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. Openings are not permitted other than the required *means of egress* doors. The vestibule shall be separated from the *stairway* or *ramp* by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The open exterior balcony shall be constructed in accordance with the *fire-resistance rating* requirements for floor assemblies.

909.20.2.1 Door closers. Doors in a smokeproof enclosure shall be self- or automatic closing by actuation of a smoke detector in accordance with Section 716.5.9.3 and shall be installed at the floor-side entrance to the smokeproof enclosure. The actuation of the smoke detector on any door shall activate the closing devices on all doors in the smokeproof enclosure at all levels.

Smoke detectors shall be installed in accordance with Section 907.3.

909.20.3 Natural ventilation alternative. The provisions of Sections 909.20.3.1 through 909.20.3.3 shall apply to ventilation of smokeproof enclosures by natural means.

909.20.3.1 Balcony doors. Where access to the *stairway* or *ramp* is by way of an open exterior balcony, the door assembly into the enclosure shall be a *fire door assembly* in accordance with Section 716.5.

909.20.3.2 Vestibule doors. Where access to the *stairway* or *ramp* is by way of a vestibule, the door assembly into the vestibule shall be a *fire door assembly* complying with Section 716.5. The door assembly from the vestibule to the *stairway* shall have not less than a 20-minute *fire protection rating* complying with Section 716.5.

909.20.3.3 Vestibule ventilation. Each vestibule shall have a minimum net area of 16 square feet (1.5 m²) of opening in a wall facing an outer *court*, *yard* or *public way* that is not less than 20 feet (6096 mm) in width.

909.20.4 Mechanical ventilation alternative. The provisions of Sections 909.20.4.1 through 909.20.4.4 shall apply to ventilation of smokeproof enclosures by mechanical means.

909.20.4.1 Vestibule doors. The door assembly from the building into the vestibule shall be a *fire door assembly* complying with Section 716.5.3. The door assembly from the vestibule to the *stairway* or *ramp* shall not have less than a 20-minute *fire protection rating* and shall meet the requirements for a smoke door assembly in accordance with Section 716.5.3. The door shall be installed in accordance with NFPA 105.

909.20.4.2 Vestibule ventilation. The vestibule shall be supplied with not less than one air change per minute and the exhaust shall be not less than 150 percent of supply. Supply air shall enter and exhaust air shall discharge from the vestibule through separate, tightly constructed ducts used only for that purpose. Supply air shall enter the vestibule within 6 inches (152 mm) of the floor level. The top of the exhaust register shall be located at the top of the smoke trap but not more than 6 inches (152 mm) down from the top of the trap, and shall be entirely within the smoke trap area. Doors in the open position shall not obstruct duct openings. Duct openings with controlling *dampers* are permitted where necessary to meet the design requirements, but *dampers* are not otherwise required.

909.20.4.2.1 Engineered ventilation system.

Where a specially engineered system is used, the system shall exhaust a quantity of air equal to not less than 90 air changes per hour from any vestibule in the emergency operation mode and shall be sized to handle three vestibules simultaneously. Smoke detectors shall be located at the floor-side entrance to each vestibule and shall activate the system for the affected vestibule. Smoke detectors shall be installed in accordance with Section 907.3.

909.20.4.3 Smoke trap. The vestibule ceiling shall be not less than 20 inches (508 mm) higher than the door opening into the vestibule to serve as a smoke and heat trap and to provide an upward-moving air column. The height shall not be decreased unless *approved* and justified by design and test.

909.20.4.4 Stairway or ramp shaft air movement system. The *stairway* or *ramp* shaft shall be provided with a dampered relief opening and supplied with sufficient air to maintain a minimum positive pressure of 0.10 inch of water (25 Pa) in the shaft relative to the vestibule with all doors closed.

909.20.5 Stairway and ramp pressurization alternative.

Where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, the vestibule is not required, provided each interior *exit stairway* or *ramp* is pressurized to not less than 0.10 inch of water (25 Pa) and not more than 0.35 inches of water (87 Pa) in the shaft relative to the building measured with all *interior exit stairway* and *ramp* doors closed under maximum anticipated conditions of stack effect and wind effect.

909.20.6 Ventilating equipment. The activation of ventilating equipment required by the alternatives in Sections 909.20.4 and 909.20.5 shall be by smoke detectors installed at each floor level at an *approved* location at the entrance to the smokeproof enclosure. When the closing device for the *stairway* and *ramp* shaft and vestibule doors is activated by smoke detection or power failure, the mechanical equipment shall activate and operate at the required performance levels. Smoke detectors shall be installed in accordance with Section 907.3.

909.20.6.1 Ventilation systems. Smokeproof enclosure ventilation systems shall be independent of other building ventilation systems. The equipment, control wiring, power wiring and ductwork shall comply with one of the following:

1. Equipment, control wiring, power wiring and ductwork shall be located exterior to the building and directly connected to the smokeproof enclosure or connected to the smokeproof enclosure by ductwork enclosed by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.
2. Equipment, control wiring, power wiring and ductwork shall be located within the smokeproof enclosure with intake or exhaust directly from and to the outside or through ductwork enclosed by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.
3. Equipment, control wiring, power wiring and ductwork shall be located within the building if separated from the remainder of the building, including other mechanical equipment, by not less than 2-hour *fire barriers* constructed in

accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

Exceptions:

1. Control wiring and power wiring utilizing a 2-hour rated cable.
2. Where encased with not less than 2 inches (51 mm) of concrete.
3. Control wiring and power wiring protected by a listed electrical circuit protective system with a fire-resistance rating of not less than 2 hours.

909.20.6.2 Standby power. Mechanical vestibule and *stairway* and *ramp* shaft ventilation systems and automatic fire detection systems shall be provided with standby power in accordance with Section 2702.

909.20.6.3 Acceptance and testing. Before the mechanical equipment is *approved*, the system shall be tested in the presence of the *building official* to confirm that the system is operating in compliance with these requirements.

909.21 Elevator hoistway pressurization alternative. Where elevator hoistway pressurization is provided in lieu of required enclosed elevator lobbies, the pressurization system shall comply with Sections 909.21.1 through 909.21.11.

909.21.1 Pressurization requirements. Elevator hoistways shall be pressurized to maintain a minimum positive pressure of 0.10 inch of water (25 Pa) and a maximum positive pressure of 0.25 inch of water (67 Pa) with respect to adjacent occupied space on all floors. This pressure shall be measured at the midpoint of each hoistway door, with all elevator cars at the floor of recall and all hoistway doors on the floor of recall open and all other hoistway doors closed. The pressure differentials shall be measured between the hoistway and the adjacent elevator landing. The opening and closing of hoistway doors at each level must be demonstrated during this test. The supply air intake shall be from an outside, uncontaminated source located a minimum distance of 20 feet (6096 mm) from any air exhaust system or outlet.

Exceptions:

1. On floors containing only Group R occupancies, the pressure differential is permitted to be measured between the hoistway and a *dwelling unit* or *sleeping unit*.
2. Where an elevator opens into a lobby enclosed in accordance with Section 3007.6 or 3008.6, the pressure differential is permitted to be measured between the hoistway and the space immediately outside the door(s) from the floor to the enclosed lobby.
3. The pressure differential is permitted to be measured relative to the outdoor atmosphere on floors other than the following:
 - 3.1. The fire floor.

3.2. The two floors immediately below the fire floor.

3.3. The floor immediately above the fire floor.

4. The minimum positive pressure of 0.10 inch of water (25 Pa) and a maximum positive pressure of 0.25 inch of water (67 Pa) with respect to occupied floors are not required at the floor of recall with the doors open.

909.21.1.1 Use of ventilation systems. Ventilation systems, other than hoistway supply air systems, are permitted to be used to exhaust air from adjacent spaces on the fire floor, two floors immediately below and one floor immediately above the fire floor to the building's exterior where necessary to maintain positive pressure relationships as required in Section 909.21.1 during operation of the elevator shaft pressurization system.

909.21.2 Rational analysis. A rational analysis complying with Section 909.4 shall be submitted with the *construction documents*.

909.21.3 Ducts for system. Any duct system that is part of the pressurization system shall be protected with the same *fire-resistance rating* as required for the elevator shaft enclosure.

909.21.4 Fan system. The fan system provided for the pressurization system shall be as required by Sections 909.21.4.1 through 909.21.4.4.

909.21.4.1 Fire resistance. Where located within the building, the fan system that provides the pressurization shall be protected with the same *fire-resistance rating* required for the elevator shaft enclosure.

909.21.4.2 Smoke detection. The fan system shall be equipped with a smoke detector that will automatically shut down the fan system when smoke is detected within the system.

909.21.4.3 Separate systems. A separate fan system shall be used for each elevator hoistway.

909.21.4.4 Fan capacity. The supply fan shall be either adjustable with a capacity of not less than 1,000 cfm (0.4719 m³/s) per door, or that specified by a *registered design professional* to meet the requirements of a designed pressurization system.

909.21.5 Standby power. The pressurization system shall be provided with standby power in accordance with Section 2702.

909.21.6 Activation of pressurization system. The elevator pressurization system shall be activated upon activation of either the building fire alarm system or the elevator lobby smoke detectors. Where both a building fire alarm system and elevator lobby smoke detectors are present, each shall be independently capable of activating the pressurization system.

909.21.7 Testing. Testing for performance shall be required in accordance with Section 909.18.8. System acceptance shall be in accordance with Section 909.19.

909.21.8 Marking and identification. Detection and control systems shall be marked in accordance with Section 909.14.

909.21.9 Control diagrams. Control diagrams shall be provided in accordance with Section 909.15.

909.21.10 Control panel. A control panel complying with Section 909.16 shall be provided.

909.21.11 System response time. Hoistway pressurization systems shall comply with the requirements for smoke control system response time in Section 909.17.

SECTION 910 SMOKE AND HEAT REMOVAL

910.1 General. Where required by this code, smoke and heat vents or mechanical smoke removal systems shall conform to the requirements of this section.

910.2 Where required. Smoke and heat vents or a mechanical smoke removal system shall be installed as required by Sections 910.2.1 and 910.2.2.

Exceptions:

1. Frozen food warehouses used solely for storage of Class I and II commodities where protected by an *approved automatic sprinkler system*.
2. Smoke and heat removal shall not be required in areas of buildings equipped with early suppression fast-response (ESFR) sprinklers.
3. Smoke and heat removal shall not be required in areas of buildings equipped with control mode special application sprinklers with a response time index of 50 (m · s)^{1/2} or less that are listed to control a fire in stored commodities with 12 or fewer sprinklers.

910.2.1 Group F-1 or S-1. Smoke and heat vents installed in accordance with Section 910.3 or a mechanical smoke removal system installed in accordance with Section 910.4 shall be installed in buildings and portions thereof used as a Group F-1 or S-1 occupancy having more than 50,000 square feet (4645 m²) of undivided area. In occupied portions of a building equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 where the upper surface of the story is not a roof assembly, a mechanical smoke removal system in accordance with Section 910.4 shall be installed.

Exception: Group S-1 aircraft repair hangars.

910.2.2 High-piled combustible storage. Smoke and heat removal required by Table 3206.2 of the *Fire Code* for buildings and portions thereof containing high-piled combustible storage shall be installed in accordance with Section 910.3 in unsprinklered buildings. In buildings and portions thereof containing high-piled combustible storage equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, a smoke and heat removal system shall be installed in accordance with Section 910.3 or 910.4. In occupied portions of a building equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, where the upper sur-

face of the story is not a roof assembly, a mechanical smoke removal system in accordance with Section 910.4 shall be installed.

910.3 Smoke and heat vents. The design and installation of smoke and heat vents shall be in accordance with Sections 910.3.1 through 910.3.3.

910.3.1 Listing and labeling. Smoke and heat vents shall be *listed* and labeled to indicate compliance with UL 793 or FM 4430.

910.3.2 Smoke and heat vent locations. Smoke and heat vents shall be located 20 feet (6096 mm) or more from adjacent *lot lines* and *fire walls* and 10 feet (3048 mm) or more from *fire barriers*. Vents shall be uniformly located within the roof in the areas of the building where the vents are required to be installed by Section 910.2 with consideration given to roof pitch, sprinkler location and structural members.

910.3.3 Smoke and heat vents area. The required aggregate area of smoke and heat vents shall be calculated as follows:

For buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1:

$$A_{VR} = V/9000 \quad \text{(Equation 9-3)}$$

where:

A_{VR} = The required aggregate vent area (ft²).

V = Volume (ft³) of the area that requires smoke removal.

For unsprinklered buildings:

$$A_{VR} = A_{FA}/50 \quad \text{(Equation 9-4)}$$

where:

A_{VR} = The required aggregate vent area (ft²).

A_{FA} = The area of the floor in the area that requires smoke removal.

910.4 Mechanical smoke removal systems. Mechanical smoke removal systems shall be designed and installed in accordance with Sections 910.4.1 through 910.4.7.

910.4.1 Automatic sprinklers required. The building shall be equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1.

910.4.2 Exhaust fan construction. Exhaust fans that are part of a mechanical smoke removal system shall be rated for operation at 221°F (105°C). Exhaust fan motors shall be located outside of the exhaust fan air stream.

910.4.3 System design criteria. The mechanical smoke removal system shall be sized to exhaust the building at a minimum rate of two air changes per hour based upon the volume of the building or portion thereof without contents. The capacity of each exhaust fan shall not exceed 30,000 cubic feet per minute (14.2 m³/sec).

910.4.3.1 Makeup air. Makeup air openings shall be provided within 6 feet (1829 mm) of the floor level. Operation of makeup air openings shall be manual or automatic. The minimum gross area of makeup air

inlets shall be 8 square feet per 1,000 cubic feet per minute (0.74 m² per 0.4719 m³/s) of smoke exhaust.

910.4.4 Activation. The mechanical smoke removal system shall be activated by manual controls only.

910.4.5 Manual control location. Manual controls shall be located so as to be accessible to the fire service from an exterior door of the building and protected against interior fire exposure by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

910.4.6 Control wiring. Wiring for operation and control of mechanical smoke removal systems shall be connected ahead of the main disconnect in accordance with Section 701.12E of NFPA 70 and be protected against interior fire exposure to temperatures in excess of 1,000°F (538°C) for a period of not less than 15 minutes.

910.4.7 Controls. Where building air-handling and mechanical smoke removal systems are combined or where independent building air-handling systems are provided, fans shall automatically shut down in accordance with the *Mechanical Code*. The manual controls provided for the smoke removal system shall have the capability to override the automatic shutdown of fans that are part of the smoke removal system.

910.5 Maintenance. Smoke and heat vents and mechanical smoke removal systems shall be maintained in accordance with the *Fire Code*.

SECTION 911 FIRE COMMAND CENTER

911.1 General. Where required by other sections of this code and in buildings classified as high-rise buildings by this code, a fire command center for fire department operations shall be provided and shall comply with Sections 911.1.1 through 911.1.6.

911.1.1 Location and access. The fire command center shall be directly accessible from the exterior on the address side of the building; or, where approved by the *code official* in consultation with the Fire Chief, in an interior location which has direct access from the entrance lobby on the address side of the building.

911.1.1.1 Identification. The entrance door to the fire command center shall be illuminated and clearly marked "Fire Command Center" with letters a minimum of 3 inches (76 mm) in height on a contrasting background. In instances where the fire command center is not located near the building's main entrance, a sign indicating the location of the fire control room shall be conspicuously posted near the building's main entrance.

911.1.1.2 Prohibited use. Electrical, mechanical or plumbing equipment other than those associated with the fire command center, shall not be located within the fire command center. The fire command center shall

not be used for other than its intended use unless approved by the Fire Chief.

911.1.1.3 Locking arrangements. The fire command center shall be secured from unauthorized entry and shall be accessible to the Department at all times.

911.1.1.4 Access. Where access to the fire command center from the building's exterior is restricted because of secured openings, a key box-in accordance with Section 506 of the *Fire Code* shall be installed at the building's main entrance or other approved location for Department access. The key box shall be of an *approved* type and shall contain keys to gain necessary access to the building and fire command center as required by the *code official* in consultation with the Fire Chief.

911.1.2 Separation. The fire command center shall be separated from the remainder of the building by not less than a 1-hour *fire barrier* constructed in accordance with Section 707 or *horizontal assembly* constructed in accordance with Section 711, or both.

911.1.3 Size. The room shall be of sufficient size to accommodate all equipment and features required by this section but not less than 96 square feet (8.9 m²). A minimum clear aisle width of 48 inches (1220 mm) shall be provided in front of all equipment panels.

911.1.4 Layout approval. A layout of the fire command center and all features required by this section to be contained therein shall be submitted for approval prior to installation.

911.1.5 Storage. Storage unrelated to the operation of the fire command center shall be prohibited.

911.1.6 Required features. The fire command center shall comply with NFPA 72 and shall contain all of the following features:

1. The emergency voice/alarm communication system control unit.
2. The fire department communications system.
3. Fire detection and alarm system annunciator.
4. Annunciator unit visually indicating the location of the elevators and whether they are operational.
5. The fire fighter's control panel required by Section 909.16 for smoke control systems installed in the building.
6. Controls for unlocking interior exit stairway doors simultaneously.
7. Sprinkler valve and waterflow detector display panels.
8. Emergency and standby power status indicators.
9. A telephone for Department use with controlled access to the public telephone system.
10. Fire pump status indicators.
11. Schematic building plans indicating the typical floor plan and detailing the building core, *means of egress*, fire protection systems, fire fighter air

replenishment system, fire-fighting equipment and fire department access, and other building features affecting emergency response. The schematic plans shall be readily accessible, diagrammatic in nature, and fabricated of durable material or provided with a protective cover and bound in one set.

12. A copy of the facility's Fire Safety Plans and Fire Evacuation Plans that are prepared and maintained in accordance with the *Fire Code*.
13. Generator supervision devices, manual start and transfer features.
14. Public address system, where specifically required by other sections of this code.
15. Elevator fire recall switch in accordance with ASME A17.1/BSA 44.
16. Elevator emergency or standby power selector switch(es), where emergency or standby power is provided.
17. An *approved* Building Information Card that contains, but is not limited to, the following information:
 - 17.1. General building information that includes: property name, address, the number of floors in the building (above and below grade), use and occupancy classification (for mixed uses, identify the different types of occupancies on each floor), and the estimated building population during the day, night, and weekend.
 - 17.2. Building emergency contact information that includes: a list of the building's emergency contacts including but not limited to building manager and building engineer and their respective work phone number, cell phone number, and e-mail address.
 - 17.3. Building construction information that includes: the type of building construction including but not limited to floors, walls, columns, and roof assembly.
 - 17.4. *Exit access* and *exit stairway* information that includes: number of *exit access* and *exit stairways* in the building; each *exit access* and *exit stairway* designation and floors served; location where each *exit access* and *exit stairway* discharges; *interior exit stairways* that are pressurized; *exit stairways* provided with emergency lighting; each *exit stairway* that allows reentry; *exit stairways* providing roof access; elevator information that includes: number of elevator banks, elevator bank designation, elevator car numbers and respective floors that they serve; location of elevator machine rooms, control rooms and control spaces; location of sky lobby; and location of freight elevator banks.

- 17.5. Building services and system information that includes: location of mechanical rooms, location of building management system, location and capacity of all fuel oil tanks, location of emergency generator, and location of natural gas service.
- 17.6. Fire protection system information that includes: locations of standpipes, location of fire pump room, location of fire department connections, floors protected by automatic sprinklers, location of different types of sprinkler systems installed including, but not limited to, dry, wet and pre-action.
- 17.7. Hazardous material information that includes: location of hazardous material and quantity of hazardous material.

SECTION 912 FIRE DEPARTMENT CONNECTIONS

912.1 Installation. Fire department connections shall be installed in accordance with the NFPA standard applicable to the system design and shall comply with Sections 912.2 through 912.6.

912.2 Location. With respect to hydrants, driveways, buildings and landscaping, fire department connections shall be so located that fire apparatus and hose connected to supply the system will not obstruct access to the buildings for other fire apparatus. The location of fire department connections shall be *approved* by the fire chief.

912.2.1 Visible location. Fire department connections shall be located on the street side of buildings, fully visible and recognizable from the street or nearest point of fire department vehicle access or as otherwise *approved* by the fire chief.

912.2.2 Existing buildings. On existing buildings, wherever the fire department connection is not visible to approaching fire apparatus, the fire department connection shall be indicated by an *approved* sign mounted on the street front or on the side of the building. Such sign shall have the letters "FDC" not less than 6 inches (152 mm) high and words in letters not less than 2 inches (51 mm) high or an arrow to indicate the location. Such signs shall be subject to the approval of the *fire code* official.

912.3 Fire hose threads. Fire hose threads used in connection with standpipe systems shall be *approved* and shall be compatible with fire department hose threads.

912.4 Access. Immediate access to fire department connections shall be maintained at all times and without obstruction by fences, bushes, trees, walls or any other fixed or moveable object. Access to fire department connections shall be *approved* by the fire chief.

Exception: Fences, where provided with an access gate equipped with a sign complying with the legend requirements of this section and a means of emergency operation. The gate and the means of emergency operation shall be

approved by the fire chief and maintained operational at all times.

912.4.1 Locking fire department connection caps. The *fire code* official is authorized to require locking caps on fire department connections for water-based *fire protection systems* where the responding fire department carries appropriate key wrenches for removal.

912.4.2 Clear space around connections. A working space of not less than 36 inches (762 mm) in width, 36 inches (914 mm) in depth and 78 inches (1981 mm) in height shall be provided and maintained in front of and to the sides of wall-mounted fire department connections and around the circumference of free-standing fire department connections, except as otherwise required or *approved* by the fire chief.

912.4.3 Physical protection. Where fire department connections are subject to impact by a motor vehicle, vehicle impact protection shall be provided in accordance with Section 312 of the *Fire Code*.

912.5 Signs. A metal sign with raised letters not less than 1 inch (25 mm) in size shall be mounted on all fire department connections serving automatic sprinklers, standpipes or fire pump connections. Such signs shall read: AUTOMATIC SPRINKLERS or STANDPIPES or TEST CONNECTION or a combination thereof as applicable. Where the fire department connection does not serve the entire building, a sign shall be provided indicating the portions of the building served.

912.6 Backflow protection. The potable water supply to automatic sprinkler and standpipe systems shall be protected against backflow as required by the *Plumbing Code*.

SECTION 913 FIRE PUMPS

913.1 General. Where provided, fire pumps shall be installed in accordance with this section and NFPA 20.

913.2 Protection against interruption of service. The fire pump, driver and controller shall be protected in accordance with NFPA 20 against possible interruption of service through damage caused by explosion, fire, flood, earthquake, rodents, insects, windstorm, freezing, vandalism and other adverse conditions.

913.2.1 Protection of fire pump rooms. Fire pumps shall be located in rooms that are separated from all other areas of the building by 2-hour *fire barriers* constructed in accordance with Section 707 or 2-hour *horizontal assemblies* constructed in accordance with Section 711, or both.

Exceptions:

1. In other than high-rise buildings, separation by 1-hour *fire barriers* constructed in accordance with Section 707 or 1-hour *horizontal assemblies* constructed in accordance with Section 711, or both, shall be permitted in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.

2. Separation is not required for fire pumps physically separated in accordance with NFPA 20.
3. Access to the fire pump room shall not be required to be directly from the exterior or from a fire-rated enclosure.

913.2.2 Circuits supplying fire pumps. Cables used for survivability of circuits supplying fire pumps shall be *listed* in accordance with UL 2196. Electrical circuit protective systems shall be installed in accordance with their listing requirements.

913.3 Temperature of pump room. Suitable means shall be provided for maintaining the temperature of a pump room or pump house, where required, above 40°F (5°C).

913.3.1 Engine manufacturer's recommendation. Temperature of the pump room, pump house or area where engines are installed shall never be less than the minimum recommended by the engine manufacturer. The engine manufacturer's recommendations for oil heaters shall be followed.

913.4 Valve supervision. Where provided, the fire pump suction, discharge and bypass valves, and isolation valves on the backflow prevention device or assembly shall be supervised open by one of the following methods:

1. Central-station, proprietary or remote-station signaling service.
2. Local signaling service that will cause the sounding of an audible signal at a *constantly attended location*.
3. Locking valves open.
4. Sealing of valves and *approved* weekly recorded inspection where valves are located within fenced enclosures under the control of the owner.

913.4.1 Test outlet valve supervision. Fire pump test outlet valves shall be supervised in the closed position.

913.5 Acceptance test. Acceptance testing shall be done in accordance with the requirements of NFPA 20.

SECTION 914

EMERGENCY RESPONDER SAFETY FEATURES

914.1 Shaftway markings. Vertical shafts shall be identified as required by Sections 914.1.1 and 914.1.2.

914.1.1 Exterior access to shaftways. Outside openings accessible to the fire department and that open directly on a hoistway or shaftway communicating between two or more floors in a building shall be plainly marked with the word "SHAFTWAY" in red letters not less than 6 inches (152 mm) high on a white background. Such warning signs shall be placed so as to be readily discernible from the outside of the building.

914.1.2 Interior access to shaftways. Door or window openings to a hoistway or shaftway from the interior of the building shall be plainly marked with the word "SHAFTWAY" in red letters not less than 6 inches (152 mm) high

on a white background. Such warning signs shall be placed so as to be readily discernible.

Exception: Markings shall not be required on shaftway openings that are readily discernible as openings onto a shaftway by the construction or arrangement.

914.2 Equipment room identification. Fire protection equipment shall be identified in an *approved* manner. Rooms containing controls for air-conditioning systems, sprinkler risers and valves or other fire detection, suppression or control elements shall be identified for the use of the fire department. *Approved* signs required to identify fire protection equipment and equipment location shall be constructed of durable materials, permanently installed and readily visible.

SECTION 915

CARBON MONOXIDE DETECTION

915.1 General. Carbon monoxide detection shall be installed in new buildings in accordance with Sections 915.1.1 through 915.6. Carbon monoxide detection shall be installed in existing buildings in accordance with Chapter 11 of the *Fire Code*.

915.1.1 Where required. Carbon monoxide detection shall be provided in Group I-1, I-2, I-4 and R occupancies and in classrooms in Group E occupancies in the locations specified in Section 915.2 where any of the conditions in Sections 915.1.2 through 915.1.6 exist.

915.1.2 Fuel-burning appliances and fuel-burning fireplaces. Carbon monoxide detection shall be provided in *dwelling units*, *sleeping units* and classrooms that contain a fuel-burning appliance or a fuel-burning fireplace.

915.1.3 Forced-air furnaces. Carbon monoxide detection shall be provided in *dwelling units*, *sleeping units* and classrooms served by a fuel-burning, forced-air furnace.

Exception: Carbon monoxide detection shall not be required in *dwelling units*, *sleeping units* and classrooms if carbon monoxide detection is provided in the first room or area served by each main duct leaving the furnace, and the carbon monoxide alarm signals are automatically transmitted to an approved location.

915.1.4 Fuel-burning appliances outside of dwelling units, sleeping units and classrooms. Carbon monoxide detection shall be provided in *dwelling units*, *sleeping units* and classrooms located in buildings that contain fuel-burning appliances or fuel-burning fireplaces.

Exceptions:

1. Carbon monoxide detection shall not be required in *dwelling units*, *sleeping units* and classrooms where there are no communicating openings between the fuel-burning appliance or fuel-burning fireplace and the *dwelling unit*, *sleeping unit* or classroom.
2. Carbon monoxide detection shall not be required in *dwelling units*, *sleeping units* and classrooms

where carbon monoxide detection is provided in one of the following locations:

- 2.1. In an approved location between the fuel-burning appliance or fuel-burning fireplace and the *dwelling unit*, *sleeping unit* or classroom.
- 2.2. On the ceiling of the room containing the fuel-burning appliance or fuel-burning fireplace.

915.1.5 Private garages. Carbon monoxide detection shall be provided in *dwelling units*, *sleeping units* and classrooms in buildings with attached private garages.

Exceptions:

1. Carbon monoxide detection shall not be required where there are no communicating openings between the private garage and the *dwelling unit*, *sleeping unit* or classroom.
2. Carbon monoxide detection shall not be required in *dwelling units*, *sleeping units* and classrooms located more than one story above or below a private garage.
3. Carbon monoxide detection shall not be required where the private garage connects to the building through an open-ended corridor.
4. Where carbon monoxide detection is provided in an approved location between openings to a private garage and *dwelling units*, *sleeping units* or classrooms, carbon monoxide detection shall not be required in the *dwelling units*, *sleeping units* or classrooms.

915.1.6 Exempt garages. For determining compliance with Section 915.1.5, an *open parking garage* complying with Section 406.5 or an enclosed parking garage complying with Section 406.6 shall not be considered a private garage.

915.2 Locations. Where required by Section 915.1.1, carbon monoxide detection shall be installed in the locations specified in Sections 915.2.1 through 915.2.3.

915.2.1 Dwelling units. Carbon monoxide detection shall be installed in *dwelling units* outside of each separate sleeping area in the immediate vicinity of the bedrooms. Where a fuel-burning appliance is located within a bedroom or its attached bathroom, carbon monoxide detection shall be installed within the bedroom.

915.2.2 Sleeping units. Carbon monoxide detection shall be installed in *sleeping units*.

Exception: Carbon monoxide detection shall be allowed to be installed outside of each separate sleeping area in the immediate vicinity of the *sleeping unit* where the *sleeping unit* or its attached bathroom does not contain a fuel-burning appliance and is not served by a forced air furnace.

915.2.3 Group E occupancies. Carbon monoxide detection shall be installed in classrooms in Group E occupancies. Carbon monoxide alarm signals shall be

automatically transmitted to an on-site location that is staffed by school personnel.

Exception: Carbon monoxide alarm signals shall not be required to be automatically transmitted to an on-site location that is staffed by school personnel in Group E occupancies with an occupant load of 30 or less.

915.3 Detection equipment. Carbon monoxide detection required by Sections 915.1 through 915.2.3 shall be provided by carbon monoxide alarms complying with Section 915.4 or carbon monoxide detection systems complying with Section 915.5.

915.4 Carbon monoxide alarms. Carbon monoxide alarms shall comply with Sections 915.4.1 through 915.4.3.

915.4.1 Power source. Carbon monoxide alarms shall receive their primary power from the building wiring where such wiring is served from a commercial source, and when primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than that required for overcurrent protection.

Exception: Where installed in buildings without commercial power, battery-powered carbon monoxide alarms shall be an acceptable alternative.

915.4.2 Listings. Carbon monoxide alarms shall be listed in accordance with UL 2034.

915.4.3 Combination alarms. Combination carbon monoxide/smoke alarms shall be an acceptable alternative to carbon monoxide alarms. Combination carbon monoxide/smoke alarms shall be listed in accordance with UL 2034 and UL 217.

915.5 Carbon monoxide detection systems. Carbon monoxide detection systems shall be an acceptable alternative to carbon monoxide alarms and shall comply with Sections 915.5.1 through 915.5.3.

915.5.1 General. Carbon monoxide detection systems shall comply with NFPA 720. Carbon monoxide detectors shall be listed in accordance with UL 2075.

915.5.2 Locations. Carbon monoxide detectors shall be installed in the locations specified in Section 915.2. These locations supersede the locations specified in NFPA 720.

915.5.3 Combination detectors. Combination carbon monoxide/smoke detectors installed in carbon monoxide detection systems shall be an acceptable alternative to carbon monoxide detectors, provided they are listed in accordance with UL 2075 and UL 268.

915.6 Maintenance. Carbon monoxide alarms and carbon monoxide detection systems shall be maintained in accordance with the *Fire Code*.

SECTION 916

EMERGENCY RESPONDER RADIO COVERAGE

916.1 General. Emergency responder radio coverage shall be provided in all new buildings in accordance with Section 510 of the *Fire Code*.

917

FIRE APPARATUS ACCESS ROADS

917.1 General. Fire apparatus access roads shall be provided and maintained in accordance with Section 503 of the *Fire Code*.

918

KEY BOXES

918.1 General. Key boxes shall be provided and maintained in accordance with Section 506 of the *Fire Code*.

918.2 Where required. Key boxes are required where access to or within a structure or an area is restricted.

CHAPTER 10

MEANS OF EGRESS

SECTION 1001 ADMINISTRATION

1001.1 General. Buildings or portions thereof shall be provided with a *means of egress* system as required by this chapter. The provisions of this chapter shall control the design, construction and arrangement of *means of egress* components required to provide an *approved means of egress* from structures and portions thereof.

1001.2 Minimum requirements. It shall be unlawful to alter a building or structure in a manner that will reduce the number of *exits* or the minimum width or required capacity of the *means of egress* to less than required by this code.

1001.3 Maintenance. *Means of egress* shall be maintained in accordance with the *Fire Code*.

1001.4 Fire safety and evacuation plans. Fire safety and evacuation plans shall be provided for all occupancies and buildings where required by the *Fire Code*. Such fire safety and evacuation plans shall comply with the applicable provisions of Sections 401.2 and 404 of the *Fire Code*.

SECTION 1002 DEFINITIONS

1002.1 Definitions. The following terms are defined in Chapter 2:

ACCESSIBLE MEANS OF EGRESS.

AISLE.

AISLE ACCESSWAY.

ALTERNATING TREAD DEVICE.

AREA OF REFUGE.

BLEACHERS.

BREAKOUT.

COMMON PATH OF EGRESS TRAVEL.

CORRIDOR.

DOOR, BALANCED.

EGRESS COURT.

EMERGENCY ESCAPE AND RESCUE OPENING.

EXIT.

EXIT ACCESS.

EXIT ACCESS DOORWAY.

EXIT ACCESS RAMP.

EXIT ACCESS STAIRWAY.

EXIT DISCHARGE.

EXIT DISCHARGE, LEVEL OF.

EXIT, HORIZONTAL.

EXIT PASSAGEWAY.

EXTERIOR EXIT RAMP.

EXTERIOR EXIT STAIRWAY.

FIRE EXIT HARDWARE.

FIXED SEATING.

FLIGHT.

FLOOR AREA, GROSS.

FLOOR AREA, NET.

FOLDING AND TELESCOPIC SEATING.

GRANDSTAND.

GUARD.

HANDRAIL.

INTERIOR EXIT RAMP.

INTERIOR EXIT STAIRWAY.

LOW ENERGY POWER-OPERATED DOOR.

MEANS OF EGRESS.

MERCHANDISE PAD.

NOSING.

OCCUPANT LOAD.

OPEN-ENDED CORRIDOR.

PANIC HARDWARE.

PHOTOLUMINESCENT.

POWER-ASSISTED DOOR.

POWER-OPERATED DOOR.

PUBLIC WAY.

RAMP.

SCISSOR STAIRWAY.

SELF-LUMINOUS.

SMOKE-PROTECTED ASSEMBLY SEATING.

STAIR.

STAIRWAY.

STAIRWAY, SPIRAL.

WINDER.

SECTION 1003 GENERAL MEANS OF EGRESS

1003.1 Applicability. The general requirements specified in Sections 1003 through 1015 shall apply to all three elements of the *means of egress* system, in addition to those specific requirements for the *exit access*, the *exit* and the *exit discharge* detailed elsewhere in this chapter.

1003.2 Ceiling height. The *means of egress* shall have a ceiling height of not less than 7 feet 6 inches (2286 mm).

Exceptions:

1. Sloped ceilings in accordance with Section 1208.2.
2. Ceilings of *dwelling units* and *sleeping units* within residential occupancies in accordance with Section 1208.2.
3. Allowable projections in accordance with Section 1003.3.
4. *Stair* headroom in accordance with Section 1011.3.
5. Door height in accordance with Section 1010.1.1.
6. *Ramp* headroom in accordance with Section 1012.5.2.
7. The clear height of floor levels in vehicular and pedestrian traffic areas of public and private parking garages in accordance with Section 406.4.1.
8. Areas above and below *mezzanine* floors in accordance with Section 505.2.
9. The *exit discharge* and *exit passageways* in a *means of egress* system shall be allowed to have a ceiling height of not less than 7 feet (2134 mm).

1003.3 Protruding objects. Protruding objects on *circulation paths* shall comply with the requirements of Sections 1003.3.1 through 1003.3.4.

1003.3.1 Headroom. Protruding objects are permitted to extend below the minimum ceiling height required by Section 1003.2 where a minimum headroom of 80 inches (2032 mm) is provided over any walking surface, including walks, *corridors*, *aisles* and passageways. Not more than 50 percent of the ceiling area of a *means of egress* shall be reduced in height by protruding objects.

Exception: Door closers and stops shall not reduce headroom to less than 78 inches (1981 mm).

A barrier shall be provided where the vertical clearance is less than 80 inches (2032 mm) high. The leading edge of such a barrier shall be located 27 inches (686 mm) maximum above the floor.

1003.3.2 Post-mounted objects. A free-standing object mounted on a post or pylon shall not overhang that post or pylon more than 4 inches (102 mm) where the lowest point of the leading edge is more than 27 inches (686 mm) and less than 80 inches (2032 mm) above the walking surface. Where a sign or other obstruction is mounted between posts or pylons and the clear distance between the posts or pylons is greater than 12 inches (305 mm), the lowest edge of such sign or obstruction shall be 27 inches (686 mm) maximum or 80 inches (2032 mm) minimum above the finished floor or ground.

Exception: These requirements shall not apply to sloping portions of *handrails* between the top and bottom riser of *stairs* and above the *ramp* run.

1003.3.3 Horizontal projections. Objects with leading edges more than 27 inches (685 mm) and not more than 80 inches (2030 mm) above the floor shall not project hori-

zontally more than 4 inches (102 mm) into the *circulation path*.

Exception: *Handrails* are permitted to protrude 4½ inches (114 mm) from the wall.

1003.3.4 Clear width. Protruding objects shall not reduce the minimum clear width of *accessible routes*.

1003.4 Floor surface. Walking surfaces of the *means of egress* shall have a slip-resistant surface and be securely attached.

1003.5 Elevation change. Where changes in elevation of less than 12 inches (305 mm) exist in the *means of egress*, sloped surfaces shall be used. Where the slope is greater than one unit vertical in 20 units horizontal (5-percent slope), *ramps* complying with Section 1012 shall be used. Where the difference in elevation is 6 inches (152 mm) or less, the *ramp* shall be equipped with either *handrails* or floor finish materials that contrast with adjacent floor finish materials.

Exceptions:

1. A single step with a maximum riser height of 7 inches (178 mm) is permitted for buildings with occupancies in Groups F, H, R-2, R-3, S and U at exterior doors not required to be *accessible* by Chapter 11.
2. A *stair* with a single riser or with two risers and a tread is permitted at locations not required to be *accessible* by Chapter 11 where the risers and treads comply with Section 1011.5, the minimum depth of the tread is 13 inches (330 mm) and not less than one *handrail* complying with Section 1014 is provided within 30 inches (762 mm) of the centerline of the normal path of egress travel on the *stair*.
3. A step is permitted in *aisles* serving seating that has a difference in elevation less than 12 inches (305 mm) at locations not required to be *accessible* by Chapter 11, provided that the risers and treads comply with Section 1029.13 and the *aisle* is provided with a *handrail* complying with Section 1029.15.

Throughout a story in a Group I-2 occupancy, any change in elevation in portions of the *means of egress* that serve nonambulatory persons shall be by means of a *ramp* or sloped walkway.

1003.6 Means of egress continuity. The path of egress travel along a *means of egress* shall not be interrupted by a building element other than a *means of egress* component as specified in this chapter. Obstructions shall not be placed in the minimum width or required capacity of a *means of egress* component except projections permitted by this chapter. The minimum width or required capacity of a *means of egress* system shall not be diminished along the path of egress travel.

1003.7 Elevators, escalators and moving walks. Elevators, escalators and moving walks shall not be used as a component of a required *means of egress* from any other part of the building.

Exception: Elevators used as an accessible *means of egress* in accordance with Section 1009.4.

SECTION 1004 OCCUPANT LOAD

1004.1 Design occupant load. In determining *means of egress* requirements, the number of occupants for whom *means of egress* facilities are provided shall be determined in accordance with this section.

1004.1.1 Cumulative occupant loads. Where the path of egress travel includes intervening rooms, areas or spaces, cumulative *occupant loads* shall be determined in accordance with this section.

1004.1.1.1 Intervening spaces or accessory areas.

Where occupants egress from one or more rooms, areas or spaces through others, the design *occupant load* shall be the combined *occupant load* of interconnected accessory or intervening spaces. Design of egress path capacity shall be based on the cumulative portion of *occupant loads* of all rooms, areas or spaces to that point along the path of egress travel.

1004.1.1.2 Adjacent levels for mezzanines. That portion of the *occupant load* of a *mezzanine* with required egress through a room, area or space on an adjacent level shall be added to the *occupant load* of that room, area or space.

1004.1.1.3 Adjacent stories. Other than for the egress components designed for convergence in accordance with Section 1005.6, the *occupant load* from separate stories shall not be added.

1004.1.2 Areas without fixed seating. The number of occupants shall be computed at the rate of one occupant per unit of area as prescribed in Table 1004.1.2. For areas without *fixed seating*, the occupant load shall be not less than that number determined by dividing the floor area under consideration by the *occupant load* factor assigned to the function of the space as set forth in Table 1004.1.2. Where an intended function is not listed in Table 1004.1.2, the *building official* shall establish a function based on a listed function that most nearly resembles the intended function.

Exception: Where *approved* by the *building official*, the actual number of occupants for whom each occupied space, floor or building is designed, although less than those determined by calculation, shall be permitted to be used in the determination of the design *occupant load*.

1004.2 Increased occupant load. The *occupant load* permitted in any building, or portion thereof, is permitted to be increased from that number established for the occupancies in Table 1004.1.2, provided that all other requirements of the code are met based on such modified number and the *occupant load* does not exceed one occupant per 7 square feet (0.65 m²) of occupiable floor space. Where required by the *building official*, an *approved aisle*, seating or fixed equipment diagram substantiating any increase in *occupant load* shall be submitted. Where required by the *building official*, such diagram shall be posted.

1004.3 Posting of occupant load. Every room or space that is an assembly occupancy shall have the *occupant load* of the room or space posted in a conspicuous place, near the main

TABLE 1004.1.2
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

| FUNCTION OF SPACE | OCCUPANT LOAD FACTOR ^a |
|--|-----------------------------------|
| Accessory storage areas, mechanical equipment room | 300 gross |
| Agricultural building | 300 gross |
| Aircraft hangars | 500 gross |
| Airport terminal | |
| Baggage claim | 20 gross |
| Baggage handling | 300 gross |
| Concourse | 100 gross |
| Waiting areas | 15 gross |
| Assembly | |
| Gaming floors (keno, slots, etc.) | 11 gross |
| Exhibit gallery and museum | 30 net |
| Assembly with fixed seats | See Section 1004.4 |
| Assembly without fixed seats | |
| Concentrated (chairs only—not fixed) | 7 net |
| Standing space | 5 net |
| Unconcentrated (tables and chairs) | 15 net |
| Bowling centers, allow 5 persons for each lane including 15 feet of runway, and for additional areas | 7 net |
| Business areas | 100 gross |
| Courtrooms—other than fixed seating areas | 40 net |
| Day care | 35 net |
| Dormitories | 50 gross |
| Educational | |
| Classroom area | 20 net |
| Shops and other vocational room areas | 50 net |
| Exercise rooms | 50 gross |
| Group H-5 Fabrication and manufacturing areas | 200 gross |
| Industrial areas | 100 gross |
| Institutional areas | |
| Inpatient treatment areas | 240 gross |
| Outpatient areas | 100 gross |
| Sleeping areas | 120 gross |
| Kitchens, commercial | 200 gross |
| Library | |
| Reading rooms | 50 net |
| Stack area | 100 gross |
| Locker rooms | 50 gross |
| Mall buildings—covered and open | See Section 402.8.2 |
| Mercantile | 60 gross |
| Storage, stock, shipping areas | 300 gross |
| Parking garages | 200 gross |
| Residential | 200 gross |
| Skating rinks, swimming pools | |
| Rink and pool | 50 gross |
| Decks | 15 gross |
| Stages and platforms | 15 net |
| Warehouses | 500 gross |

For SI: 1 square foot = 0.0929 m², 1 foot = 304.8 mm.

a. Floor area in square feet per occupant.

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exit or *exit access doorway* from the room or space. Posted signs shall be of an approved legible permanent design and shall be maintained by the owner or the owner's authorized agent.

1004.4 Fixed seating. For areas having *fixed seats* and *aisles*, the *occupant load* shall be determined by the number of *fixed seats* installed therein. The *occupant load* for areas in which *fixed seating* is not installed, such as waiting spaces, shall be determined in accordance with Section 1004.1.2 and added to the number of *fixed seats*.

The *occupant load* of *wheelchair spaces* and the associated companion seat shall be based on one occupant for each *wheelchair space* and one occupant for the associated companion seat provided in accordance with Section 1108.2.3.

For areas having *fixed seating* without dividing arms, the *occupant load* shall be not less than the number of seats based on one person for each 18 inches (457 mm) of seating length.

The *occupant load* of seating booths shall be based on one person for each 24 inches (610 mm) of booth seat length measured at the backrest of the seating booth.

1004.5 Outdoor areas. *Yards, patios, courts* and similar outdoor areas accessible to and usable by the building occupants shall be provided with *means of egress* as required by this chapter. The *occupant load* of such outdoor areas shall be assigned by the *building official* in accordance with the anticipated use. Where outdoor areas are to be used by persons in addition to the occupants of the building, and the path of egress travel from the outdoor areas passes through the building, *means of egress* requirements for the building shall be based on the sum of the *occupant loads* of the building plus the outdoor areas.

Exceptions:

1. Outdoor areas used exclusively for service of the building need only have one *means of egress*.
2. Both outdoor areas associated with Group R-3 and individual dwelling units of Group R-2.

1004.6 Multiple occupancies. Where a building contains two or more occupancies, the *means of egress* requirements shall apply to each portion of the building based on the occupancy of that space. Where two or more occupancies utilize portions of the same *means of egress* system, those egress components shall meet the more stringent requirements of all occupancies that are served.

SECTION 1005 MEANS OF EGRESS SIZING

1005.1 General. All portions of the *means of egress* system shall be sized in accordance with this section.

Exception: *Aisles* and *aisle accessways* in rooms or spaces used for assembly purposes complying with Section 1029.

1005.2 Minimum width based on component. The minimum width, in inches (mm), of any *means of egress* components shall be not less than that specified for such component, elsewhere in this code.

1005.3 Required capacity based on occupant load. The required capacity, in inches (mm), of the *means of egress* for any room, area, space or story shall be not less than that determined in accordance with Sections 1005.3.1 and 1005.3.2.

1005.3.1 Stairways. The capacity, in inches, of *means of egress stairways* shall be calculated by multiplying the *occupant load* served by such *stairways* by a means of egress capacity factor of 0.3 inch (7.6 mm) per occupant. Where *stairways* serve more than one story, only the occupant load of each story considered individually shall be used in calculating the required capacity of the *stairways* serving that story.

Exceptions:

1. For other than Group H and I-2 occupancies, the capacity, in inches (mm), of the *means of egress stairways* shall be calculated by multiplying the *occupant load* served by the *stairway* by a means of egress capacity factor of 0.2 inch (5.1 mm) per occupant in buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2.
2. Facilities with *smoke-protected assembly seating* shall be permitted to use the capacity factors in Table 1029.6.2 indicated for stepped *aisles* for *exit access* or *exit stairways* where the entire path for *means of egress* from the seating to the *exit discharge* is provided with a smoke control system complying with Section 909.
3. Facilities with outdoor *smoke-protected assembly seating* shall be permitted to use the capacity factors in Table 1029.6.3 indicated for stepped *aisles* for *exit access* or *exit stairways* where the entire path for *means of egress* from the seating to the *exit discharge* is open to the outdoors.

1005.3.2 Other egress components. The capacity, in inches, of *means of egress* components other than *stairways* shall be calculated by multiplying the *occupant load* served by such component by a means of egress capacity factor of 0.2 inch (5.1 mm) per occupant.

Exceptions:

1. For other than Group H and I-2 occupancies, the capacity, in inches (mm), of *means of egress* components other than *stairways* shall be calculated by multiplying the *occupant load* served by such component by a means of egress capacity factor of 0.15 inch (3.8 mm) per occupant in buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2.

2. Facilities with *smoke-protected assembly seating* shall be permitted to use the capacity factors in Table 1029.6.2 indicated for level or ramped aisles for *means of egress* components other than *stairways* where the entire path for *means of egress* from the seating to the *exit discharge* is provided with a smoke control system complying with Section 909.
3. Facilities with outdoor *smoke-protected assembly seating* shall be permitted to use the capacity factors in Table 1029.6.3 indicated for level or ramped aisles for *means of egress* components other than *stairways* where the entire path for *means of egress* from the seating to the *exit discharge* is open to the outdoors.

1005.4 Continuity. The minimum width or required capacity of the *means of egress* required from any story of a building shall not be reduced along the path of egress travel until arrival at the public way.

1005.5 Distribution of minimum width and required capacity. Where more than one *exit*, or access to more than one *exit*, is required, the *means of egress* shall be configured such that the loss of any one *exit*, or access to one *exit*, shall not reduce the available capacity or width to less than 50 percent of the required capacity or width.

1005.6 Egress convergence. Where the *means of egress* from stories above and below converge at an intermediate level, the capacity of the *means of egress* from the point of convergence shall be not less than the largest minimum width or the sum of the required capacities for the *stairways* or *ramps* serving the two adjacent stories, whichever is larger.

1005.7 Encroachment. Encroachments into the required *means of egress* width shall be in accordance with the provisions of this section.

1005.7.1 Doors. Doors, when fully opened, shall not reduce the required width by more than 7 inches (178 mm). Doors in any position shall not reduce the required width by more than one-half.

Exceptions:

1. Surface-mounted latch release hardware shall be exempt from inclusion in the 7-inch maximum (178 mm) encroachment where both of the following conditions exist:
 - 1.1. The hardware is mounted to the side of the door facing away from the adjacent wall where the door is in the open position.
 - 1.2. The hardware is mounted not less than 34 inches (865 mm) nor more than 48 inches (1219 mm) above the finished floor.
2. The restrictions on door swing shall not apply to doors within individual *dwelling units* and *sleeping units* of Group R-2 occupancies and *dwelling units* of Group R-3 occupancies.

1005.7.2 Other projections. *Handrail* projections shall be in accordance with the provisions of Section 1014.8. Other nonstructural projections such as trim and similar decorative features shall be permitted to project into the required width not more than 1½ inches (38 mm) on each side.

Exception: Projections are permitted in corridors within Group I-2 Condition 1 in accordance with Section 407.4.3.

1005.7.3 Protruding objects. Protruding objects shall comply with the applicable requirements of Section 1003.3.

SECTION 1006 NUMBER OF EXITS AND EXIT ACCESS DOORWAYS

1006.1 General. The number of *exits* or *exit access doorways* required within the *means of egress* system shall comply with the provisions of Section 1006.2 for spaces, including *mezzanines*, and Section 1006.3 for *stories*.

1006.2 Egress from spaces. Rooms, areas or spaces, including *mezzanines*, within a *story* or *basement* shall be provided with the number of *exits* or access to *exits* in accordance with this section.

1006.2.1 Egress based on occupant load and common path of egress travel distance. Two *exits* or *exit access doorways* from any space shall be provided where the design *occupant load* or the *common path of egress travel* distance exceeds the values listed in Table 1006.2.1.

Exceptions:

1. In Group R-2 and R-3 occupancies, one *means of egress* is permitted within and from individual *dwelling units* with a maximum *occupant load* of 20 where the *dwelling unit* is equipped throughout with an *automatic sprinkler* system in accordance with Section 903.3.1.1 or 903.3.1.2 and the *common path of egress travel* does not exceed 125 feet (38 100 mm).
2. *Care suites* in Group I-2 occupancies complying with Section 407.4.

1006.2.1.1 Three or more exits or exit access doorways. Three *exits* or *exit access doorways* shall be provided from any space with an occupant load of 501 to 1,000. Four *exits* or *exit access doorways* shall be provided from any space with an occupant load greater than 1,000.

1006.2.2 Egress based on use. The numbers of *exits* or access to *exits* shall be provided in the uses described in Sections 1006.2.2.1 through 1006.2.2.5.

1006.2.2.1 Boiler, incinerator and furnace rooms. Two *exit access doorways* are required in boiler, incinerator and furnace rooms where the area is over 500 square feet (46 m²) and any fuel-fired equipment exceeds 400,000 British thermal units (Btu) (422 000

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KJ) input capacity. Where two *exit access doorways* are required, one is permitted to be a fixed ladder or an *alternating tread device*. *Exit access doorways* shall be separated by a horizontal distance equal to one-half the length of the maximum overall diagonal dimension of the room.

1006.2.2.2 Refrigeration machinery rooms. Machinery rooms larger than 1,000 square feet (93 m²) shall have not less than two *exits* or *exit access doorways*. Where two *exit access doorways* are required, one such doorway is permitted to be served by a fixed ladder or an *alternating tread device*. *Exit access doorways* shall be separated by a horizontal distance equal to one-half the maximum horizontal dimension of the room.

All portions of machinery rooms shall be within 150 feet (45 720 mm) of an *exit* or *exit access doorway*. An increase in *exit access* travel distance is permitted in accordance with Section 1017.1.

Doors shall swing in the direction of egress travel, regardless of the *occupant load* served. Doors shall be tight fitting and self-closing.

1006.2.2.3 Refrigerated rooms or spaces. Rooms or spaces having a floor area larger than 1,000 square feet

(93 m²), containing a refrigerant evaporator and maintained at a temperature below 68°F (20°C), shall have access to not less than two *exits* or *exit access doorways*.

Exit access travel distance shall be determined as specified in Section 1017.1, but all portions of a refrigerated room or space shall be within 150 feet (45 720 mm) of an *exit* or *exit access doorway* where such rooms are not protected by an approved *automatic sprinkler system*. Egress is allowed through adjoining refrigerated rooms or spaces.

Exception: Where using refrigerants in quantities limited to the amounts based on the volume set forth in the *Mechanical Code*.

1006.2.2.4 Day care means of egress. Day care facilities, rooms or spaces where care is provided for more than 10 children that are 2½ years of age or less, shall have access to not less than two *exits* or *exit access doorways*.

1006.2.2.5 Vehicular ramps. Vehicular ramps shall not be considered as an *exit access ramp* unless pedestrian facilities are provided.

**TABLE 1006.2.1
SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY**

| OCCUPANCY | MAXIMUM OCCUPANT LOAD OF SPACE | MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (feet) | | |
|-----------------------------|-----------------------------------|--|---------|---------------------------------|
| | | Without Sprinkler System (feet) | | With Sprinkler System (feet) |
| | | Occupant Load | | |
| | | OL ≤ 30 | OL > 30 | |
| A ^c , E, M | 49 | 75 | 75 | 75 ^a |
| B | 49 | 100 | 75 | 100 ^a |
| F | 49 | 75 | 75 | 100 ^a |
| H-1, H-2, H-3 | 3 | NP | NP | 25 ^b |
| H-4, H-5 | 10 | NP | NP | 75 ^b |
| I-1, I-2 ^d , I-4 | 10 | NP | NP | 75 ^a |
| I-3 | 10 | NP | NP | 100 ^a |
| R-1 | 10 | NP | NP | 75 ^a |
| R-2 | 10 | NP | NP | 125 ^a |
| R-3 ^e | 10 | NP | NP | 125 ^a |
| R-4 ^e | 10 | 75 | 75 | 125 ^a |
| S ^f | 29 | 100 | 75 | 100 ^a |
| U | 49 | 100 | 75 | 75 ^a |

For SI: 1 foot = 304.8 mm.

NP = Not Permitted.

- Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2. See Section 903 for occupancies where *automatic sprinkler systems* are permitted in accordance with Section 903.3.1.2.
- Group H occupancies equipped throughout with an *automatic sprinkler system* in accordance with Section 903.2.5.
- For a room or space used for assembly purposes having *fixed seating*, see Section 1029.8.
- For the travel distance limitations in Group I-2, see Section 407.4.
- The length of *common path of egress travel* distance in a Group R-3 occupancy located in a mixed occupancy building or within a Group R-3 or R-4 *congregate living facility*.
- The length of *common path of egress travel* distance in a Group S-2 *open parking garage* shall be not more than 100 feet.

1006.3 Egress from stories or occupied roofs. The *means of egress* system serving any *story* or occupied roof shall be provided with the number of *exits* or access to *exits* based on the aggregate *occupant load* served in accordance with this section. The *path of egress travel* to an *exit* shall not pass through more than one adjacent *story*.

1006.3.1 Egress based on occupant load. Each *story* and occupied roof shall have the minimum number of independent *exits*, or access to *exits*, as specified in Table 1006.3.1. A single *exit* or access to a single *exit* shall be permitted in accordance with Section 1006.3.2. The required number of *exits*, or *exit access stairways* or *ramps* providing access to *exits*, from any *story* or occupied roof shall be maintained until arrival at the *exit discharge* or a *public way*.

**TABLE 1006.3.1
MINIMUM NUMBER OF EXITS OR
ACCESS TO EXITS PER STORY**

| OCCUPANT LOAD PER STORY | MINIMUM NUMBER OF EXITS OR ACCESS TO EXITS FROM STORY |
|-------------------------|---|
| 1-500 | 2 |
| 501-1,000 | 3 |
| More than 1,000 | 4 |

1006.3.2 Single exits. A single *exit* or access to a single *exit* shall be permitted from any *story* or occupied roof where one of the following conditions exists:

1. The *occupant load*, number of *dwelling units* and common path of egress travel distance does not exceed the values in Table 1006.3.2(1) or 1006.3.2(2).
2. Rooms, areas and spaces complying with Section 1006.2.1 with *exits* that discharge directly to the exterior at the *level of exit discharge*, are permitted to have one *exit* or access to a single *exit*.
3. Parking garages where vehicles are mechanically parked shall be permitted to have one *exit* or access to a single *exit*.
4. Group R-3 and R-4 occupancies shall be permitted to have one *exit* or access to a single *exit*.
5. Individual single-story or multistory *dwelling units* shall be permitted to have a single *exit* or access to a

single *exit* from the *dwelling unit* provided that both of the following criteria are met:

- 5.1. The *dwelling unit* complies with Section 1006.2.1 as a space with one *means of egress*.
- 5.2. Either the *exit* from the *dwelling unit* discharges directly to the exterior at the *level of exit discharge*, or the *exit access* outside the dwelling unit's entrance door provides access to not less than two approved independent *exits*.

1006.3.2.1 Mixed occupancies. Where one *exit*, or *exit access stairway* or *ramp* providing access to *exits* at other *stories*, is permitted to serve individual *stories*, mixed occupancies shall be permitted to be served by single *exits* provided each individual occupancy complies with the applicable requirements of Table 1006.3.2(1) or 1006.3.2(2) for that occupancy. Where applicable, cumulative *occupant loads* from adjacent occupancies shall be considered in accordance with the provisions of Section 1004.1. In each *story* of a mixed occupancy building, the maximum number of occupants served by a single *exit* shall be such that the sum of the ratios of the calculated number of occupants of the space divided by the allowable number of occupants indicated in Table 1006.3.2(2) for each occupancy does not exceed one. Where *dwelling units* are located on a story with other occupancies, the actual number of *dwelling units* divided by four plus the ratio from the other occupancy does not exceed one.

SECTION 1007 EXIT AND EXIT ACCESS DOORWAY CONFIGURATION

1007.1 General. *Exits*, *exit access doorways*, and *exit access stairways* and *ramps* serving spaces, including individual building *stories*, shall be separated in accordance with the provisions of this section.

1007.1.1 Two exits or exit access doorways. Where two *exits*, *exit access doorways*, *exit access stairways* or *ramps*, or any combination thereof, are required from any portion of the *exit access*, they shall be placed a distance apart equal to not less than one-half of the length of the

**TABLE 1006.3.2(1)
STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR R-2 OCCUPANCIES**

| STORY | OCCUPANCY | MAXIMUM NUMBER OF DWELLING UNITS | MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE |
|--|---------------------|----------------------------------|---|
| Basement, first, second or third story above grade plane | R-2 ^{a, b} | 4 dwelling units | 125 feet |
| Fourth story above grade plane and higher | NP | NA | NA |

For SI: 1 foot = 3048 mm.

NP = Not Permitted.

NA = Not Applicable.

a. Buildings classified as Group R-2 equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2 and provided with *emergency escape and rescue openings* in accordance with Section 1030.

b. This table is used for R-2 occupancies consisting of *dwelling units*. For R-2 occupancies consisting of *sleeping units*, use Table 1006.3.2(2).

1006.3.2(2)
STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR OTHER OCCUPANCIES

| STORY | OCCUPANCY | MAXIMUM OCCUPANT LOAD PER STORY | MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (feet) |
|--|---|---------------------------------|--|
| First story above or below grade plane | A, B ^b , E F ^b , M, U | 49 | 75 |
| | H-2, H-3 | 3 | 25 |
| | H-4, H-5, I, R-1, R-2 ^{a, c} , R-4 | 10 | 75 |
| | S ^{b, d} | 29 | 75 |
| Second story above grade plane | B, F, M, S ^d | 29 | 75 |
| Third story above grade plane and higher | NP | NA | NA |

For SI: 1 foot = 304.8 mm.

NP = Not Permitted.

NA = Not Applicable.

- a. Buildings classified as Group R-2 equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2 and provided with *emergency escape and rescue openings* in accordance with Section 1030.
- b. Group B, F and S occupancies in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 shall have a maximum *exit access* travel distance of 100 feet.
- c. This table is used for R-2 occupancies consisting of *sleeping units*. For R-2 occupancies consisting of *dwelling units*, use Table 1006.3.2(1).
- d. The length of *exit access* travel distance in a Group S-2 *open parking garage* shall be not more than 100 feet.

maximum overall diagonal dimension of the building or area to be served measured in a straight line between them. Interlocking or *scissor stairways* shall be counted as one *exit stairway*.

Exceptions:

1. Where interior *exit stairways* or *ramps* are interconnected by a 1-hour fire-resistance-rated *corridor* conforming to the requirements of Section 1020, the required *exit* separation shall be measured along the shortest direct line of travel within the *corridor*.
2. Where a building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2, the separation distance shall not be less than one-fourth of the length of the maximum overall diagonal dimension of the area served.

1007.1.1.1 Measurement point. The separation distance required in Section 1007.1.1 shall be measured in accordance with the following:

1. The separation distance to *exit* or *exit access doorways* shall be measured to any point along the width of the doorway.
2. The separation distance to *exit access stairways* shall be measured to the closest riser.
3. The separation distance to *exit access ramps* shall be measured to the start of the ramp run.

1007.1.2 Three or more exits or exit access doorways. Where access to three or more *exits* is required, not less than two *exit* or *exit access doorways* shall be arranged in accordance with the provisions of Section 1007.1.1. Additional required *exit* or *exit access doorways* shall be arranged a reasonable distance apart so that if one becomes blocked, the others will be available.

1007.1.3 Remoteness of exit access stairways or ramps. Where two *exit access stairways* or *ramps* provide the required *means of egress* to *exits* at another story, the required separation distance shall be maintained for all portions of such *exit access stairways* or *ramps*.

1007.1.3.1 Three or more exit access stairways or ramps. Where more than two *exit access stairways* or *ramps* provide the required *means of egress*, not less than two shall be arranged in accordance with Section 1007.1.3.

SECTION 1008
MEANS OF EGRESS ILLUMINATION

1008.1 Means of egress illumination. Illumination shall be provided in the *means of egress* in accordance with Section 1008.2. Under emergency power, means of egress illumination shall comply with Section 1008.3.

1008.2 Illumination required. The *means of egress* serving a room or space shall be illuminated at all times that the room or space is occupied.

Exceptions:

1. Occupancies in Group U.
2. *Aisle accessways* in Group A.
3. *Dwelling units* and *sleeping units* in Groups R-1, R-2 and R-3.
4. *Sleeping units* of Group I occupancies.

1008.2.1 Illumination level under normal power. The *means of egress* illumination level shall be not less than 1 footcandle (11 lux) at the walking surface.

Exception: For auditoriums, theaters, concert or opera halls and similar assembly occupancies, the illumination at the walking surface is permitted to be reduced during performances by one of the following methods

provided that the required illumination is automatically restored upon activation of a premises' fire alarm system:

1. Externally illuminated walking surfaces shall be permitted to be illuminated to not less than 0.2 footcandle (2.15 lux).
2. Steps, landings and the sides of ramps shall be permitted to be marked with self-luminous materials in accordance with Sections 1025.2.1, 1025.2.2 and 1025.2.4 by systems listed in accordance with UL 1994.

1008.2.2 Exit discharge. In Group I-2 occupancies where two or more exits are required, on the exterior landings required by Section 1010.6.1, means of egress illumination levels for the exit discharge shall be provided such that failure of any single lighting unit shall not reduce the illumination level on that landing to less than 1 footcandle (11 lux).

1008.3 Emergency power for illumination. The power supply for means of egress illumination shall normally be provided by the premises' electrical supply.

1008.3.1 General. In the event of power supply failure in rooms and spaces that require two or more means of egress, an emergency electrical system shall automatically illuminate all of the following areas:

1. *Aisles.*
2. *Corridors.*
3. *Exit access stairways and ramps.*

1008.3.2 Buildings. In the event of power supply failure in buildings that require two or more *means of egress*, an emergency electrical system shall automatically illuminate all of the following areas:

1. *Interior exit access stairways and ramps.*
2. *Interior and exterior exit stairways and ramps.*
3. *Exit passageways.*
4. Vestibules and areas on the level of discharge used for *exit discharge* in accordance with Section 1028.1.
5. Exterior landings as required by Section 1010.1.6 for *exit doorways* that lead directly to the *exit discharge*.

1008.3.3 Rooms and spaces. In the event of power supply failure, an emergency electrical system shall automatically illuminate all of the following areas:

1. Electrical equipment rooms.
2. Fire command centers.
3. Fire pump rooms.
4. Generator rooms.
5. Public restrooms with an area greater than 300 square feet (27.87 m²).

1008.3.4 Duration. The emergency power system shall provide power for a duration of not less than 90 minutes and shall consist of storage batteries, unit equipment or an

on-site generator. The installation of the emergency power system shall be in accordance with Section 2702.

1008.3.5 Illumination level under emergency power. Emergency lighting facilities shall be arranged to provide initial illumination that is not less than an average of 1 footcandle (11 lux) and a minimum at any point of 0.1 footcandle (1 lux) measured along the path of egress at floor level. Illumination levels shall be permitted to decline to 0.6 footcandle (6 lux) average and a minimum at any point of 0.06 footcandle (0.6 lux) at the end of the emergency lighting time duration. A maximum-to-minimum illumination uniformity ratio of 40 to 1 shall not be exceeded. In Group I-2 occupancies, failure of any single lighting unit shall not reduce the illumination level to less than 0.2 foot-candle (2.2 lux).

SECTION 1009 ACCESSIBLE MEANS OF EGRESS

1009.1 Accessible means of egress required. *Accessible means of egress* shall comply with this section. *Accessible spaces* shall be provided with not less than one *accessible means of egress*. Where more than one *means of egress* are required by Section 1006.2 or 1006.3 from any *accessible space*, each *accessible* portion of the space shall be served by not less than two *accessible means of egress*.

Exceptions:

1. *Accessible means of egress* are not required to be provided in existing buildings.
2. One *accessible means of egress* is required from an *accessible mezzanine* level in accordance with Section 1009.3, 1009.4 or 1009.5.
3. In assembly areas with ramped *aisles* or stepped *aisles*, one *accessible means of egress* is permitted where the *common path of egress travel* is *accessible* and meets the requirements in Section 1029.8.

1009.2 Continuity and components. Each required *accessible means of egress* shall be continuous to a *public way* and shall consist of one or more of the following components:

1. *Accessible routes* complying with Section 1104.
2. *Interior exit stairways* complying with Sections 1009.3 and 1023.
3. *Exit access stairways* complying with Sections 1009.3 and 1019.3 or 1019.4.
4. *Exterior exit stairways* complying with Sections 1009.3 and 1027 and serving levels other than the *level of exit discharge*.
5. Elevators complying with Section 1009.4.
6. Platform lifts complying with Section 1009.5.
7. *Horizontal exits* complying with Section 1026.
8. *Ramps* complying with Section 1012.
9. *Areas of refuge* complying with Section 1009.6.
10. Exterior areas for assisted rescue complying with Section 1009.7 serving exits at the *level of exit discharge*.

1009.2.1 Elevators required. In buildings where a required *accessible* floor is four or more *stories* above or below a *level of exit discharge*, not less than one required *accessible means of egress* shall be an elevator complying with Section 1009.4.

Exceptions:

1. In buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2, the elevator shall not be required on floors provided with a *horizontal exit* and located at or above the *levels of exit discharge*.
2. In buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2, the elevator shall not be required on floors provided with a *ramp* conforming to the provisions of Section 1012.

1009.3 Stairways. In order to be considered part of an *accessible means of egress*, a *stairway* between *stories* shall have a clear width of 48 inches (1219 mm) minimum between *handrails* and shall either incorporate an *area of refuge* within an enlarged floor-level landing or shall be accessed from an *area of refuge* complying with Section 1009.6. *Exit access stairways* that connect levels in the same *story* are not permitted as part of an *accessible means of egress*.

Exceptions:

1. *Exit access stairways* providing *means of egress* from *mezzanines* are permitted as part of an *accessible means of egress*.
2. The clear width of 48 inches (1219 mm) between *handrails* is not required in buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2.
3. The clear width of 48 inches (1219 mm) between *handrails* is not required for *stairways* accessed from a *refuge area* in conjunction with a *horizontal exit*.
4. *Areas of refuge* are not required at *exit access stairways* where two-way communication is provided at the elevator landing in accordance with Section 1009.8.
5. *Areas of refuge* are not required at *stairways* in buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2.
6. *Areas of refuge* are not required at *stairways* serving *open parking garages*.
7. *Areas of refuge* are not required for *smoke-protected assembly seating areas* complying with Section 1029.6.2.
8. *Areas of refuge* are not required at *stairways* in Group R-2 occupancies.

9. *Areas of refuge* are not required for *stairways* accessed from a *refuge area* in conjunction with a *horizontal exit*.

1009.4 Elevators. In order to be considered part of an *accessible means of egress*, an elevator shall comply with the emergency operation and signaling device requirements of Section 2.27 of ASME A17.1/CSA B44. Standby power shall be provided in accordance with Chapter 27 and Section 3003. The elevator shall be accessed from an *area of refuge* complying with Section 1009.6.

Exceptions:

1. *Areas of refuge* are not required at the elevator in *open parking garages*.
2. *Areas of refuge* are not required in buildings and facilities equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2.
3. *Areas of refuge* are not required at elevators not required to be located in a shaft in accordance with Section 712.
4. *Areas of refuge* are not required at elevators serving *smoke-protected assembly seating areas* complying with Section 1029.6.2.
5. *Areas of refuge* are not required for elevators accessed from a *refuge area* in conjunction with a *horizontal exit*.

1009.5 Platform lifts. Platform lifts shall be permitted to serve as part of an *accessible means of egress* where allowed as part of a required *accessible route* in Section 1109.8 except for Item 10. Standby power for the platform lift shall be provided in accordance with Chapter 27.

1009.6 Areas of refuge. Every required *area of refuge* shall be accessible from the space it serves by an *accessible means of egress*.

1009.6.1 Travel distance. The maximum travel distance from any *accessible* space to an *area of refuge* shall not exceed the *exit access* travel distance permitted for the occupancy in accordance with Section 1017.1.

1009.6.2 Stairway or elevator access. Every required *area of refuge* shall have direct access to a *stairway* complying with Sections 1009.3 and 1023 or an elevator complying with Section 1009.4.

1009.6.3 Size. Each *area of refuge* shall be sized to accommodate one *wheelchair space* of 30 inches by 48 inches (762 mm by 1219 mm) for each 200 occupants or portion thereof, based on the *occupant load* of the *area of refuge* and areas served by the *area of refuge*. Such *wheelchair spaces* shall not reduce the *means of egress* minimum width or required capacity. Access to any of the required *wheelchair spaces* in an *area of refuge* shall not be obstructed by more than one adjoining *wheelchair space*.

1009.6.4 Separation. Each *area of refuge* shall be separated from the remainder of the *story* by a *smoke barrier* complying with Section 709 or a *horizontal exit* comply-

ing with Section 1026. Each *area of refuge* shall be designed to minimize the intrusion of smoke.

Exceptions:

1. *Areas of refuge* located within an enclosure for *interior exit stairways* complying with Section 1023.
2. *Areas of refuge* in outdoor facilities where *exit access* is essentially open to the outside.

1009.6.5 Two-way communication. *Areas of refuge* shall be provided with a two-way communication system complying with Sections 1009.8.1 and 1009.8.2.

1009.7 Exterior areas for assisted rescue. Exterior areas for assisted rescue shall be accessed by an *accessible route* from the area served.

Where the *exit discharge* does not include an *accessible route* from an *exit* located on the *level of exit discharge* to a *public way*, an exterior area of assisted rescue shall be provided on the exterior landing in accordance with Sections 1009.7.1 through 1009.7.4.

1009.7.1 Size. Each exterior area for assisted rescue shall be sized to accommodate *wheelchair spaces* in accordance with Section 1009.6.3.

1009.7.2 Separation. Exterior walls separating the exterior area of assisted rescue from the interior of the building shall have a minimum *fire-resistance rating* of 1 hour, rated for exposure to fire from the inside. The fire-resistance-rated exterior wall construction shall extend horizontally 10 feet (3048 mm) beyond the landing on either side of the landing or equivalent fire-resistance-rated construction is permitted to extend out perpendicular to the exterior wall 4 feet (1220 mm) minimum on the side of the landing. The *fire-resistance-rated* construction shall extend vertically from the ground to a point 10 feet (3048 mm) above the floor level of the area for assisted rescue or to the roof line, whichever is lower. Openings within such *fire-resistance-rated* exterior walls shall be protected in accordance with Section 716.

1009.7.3 Openness. The exterior area for assisted rescue shall be open to the outside air. The sides other than the separation walls shall be not less than 50 percent open, and the open area shall be distributed so as to minimize the accumulation of smoke or toxic gases.

1009.7.4 Stairways. *Stairways* that are part of the *means of egress* for the exterior area for assisted rescue shall provide a clear width of 48 inches (1220 mm) between *handrails*.

Exception: The clear width of 48 inches (1220 mm) between *handrails* is not required at *stairways* serving buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2.

1009.8 Two-way communication. A two-way communication system complying with Sections 1009.8.1 and 1009.8.2 shall be provided at the landing serving each elevator or bank

of elevators on each accessible floor that is one or more stories above or below the *level of exit discharge*.

Exceptions:

1. Two-way communication systems are not required at the landing serving each elevator or bank of elevators where the two-way communication system is provided within *areas of refuge* in accordance with Section 1009.6.5.
2. Two-way communication systems are not required on floors provided with *ramps* conforming to the provisions of Section 1012.
3. Two-way communication systems are not required at the landings serving only service elevators that are not designated as part of the *accessible means of egress* or serve as part of the required *accessible route* into a facility.
4. Two-way communication systems are not required at the landings serving only freight elevators.
5. Two-way communication systems are not required at the landing serving a private residence elevator.

1009.8.1 System requirements. Two-way communication systems shall provide communication between each required location and the *fire command center* or a central control point location *approved* by the fire department. Where the central control point is not a *constantly attended location*, a two-way communication system shall have a timed automatic telephone dial-out capability to a monitoring location or 9-1-1. The two-way communication system shall include both audible and visible signals.

1009.8.2 Directions. Directions for the use of the two-way communication system, instructions for summoning assistance via the two-way communication system and written identification of the location shall be posted adjacent to the two-way communication system. Signage shall comply with the ICC A117.1 requirements for visual characters.

1009.9 Signage. Signage indicating special accessibility provisions shall be provided as shown:

1. Each door providing access to an *area of refuge* from an adjacent floor area shall be identified by a sign stating: AREA OF REFUGE.
2. Each door providing access to an exterior area for assisted rescue shall be identified by a sign stating: EXTERIOR AREA FOR ASSISTED RESCUE.

Signage shall comply with the ICC A117.1 requirements for visual characters and include the International Symbol of Accessibility. Where exit sign illumination is required by Section 1013.3, the signs shall be illuminated. Additionally, visual characters, raised character and braille signage complying with ICC A117.1 shall be located at each door to an *area of refuge* and exterior area for assisted rescue in accordance with Section 1013.4.

1009.10 Directional signage. Directional signage indicating the location of all other *means of egress* and which of those

MEANS OF EGRESS

are *accessible means of egress* shall be provided at the following:

1. At *exits* serving a required *accessible* space but not providing an approved *accessible means of egress*.
2. At elevator landings.
3. Within *areas of refuge*.

1009.11 Instructions. In *areas of refuge* and exterior areas for assisted rescue, instructions on the use of the area under emergency conditions shall be posted. Signage shall comply with the ICC A117.1 requirements for visual characters. The instructions shall include all of the following:

1. Persons able to use the *exit stairway* do so as soon as possible, unless they are assisting others.
2. Information on planned availability of assistance in the use of *stairs* or supervised operation of elevators and how to summon such assistance.
3. Directions for use of the two-way communication system where provided.

SECTION 1010 DOORS, GATES AND TURNSTILES

1010.1 Doors. *Means of egress* doors shall meet the requirements of this section. Doors serving a *means of egress* system shall meet the requirements of this section and Section 1022.2. Doors provided for egress purposes in numbers greater than required by this code shall meet the requirements of this section.

Means of egress doors shall be readily distinguishable from the adjacent construction and finishes such that the doors are easily recognizable as doors. Mirrors or similar reflecting materials shall not be used on *means of egress* doors. *Means of egress* doors shall not be concealed by curtains, drapes, decorations or similar materials.

1010.1.1 Size of doors. The required capacity of each door opening shall be sufficient for the *occupant load* thereof and shall provide a minimum clear width of 32 inches (813 mm). Clear openings of doorways with swinging doors shall be measured between the face of the door and the stop, with the door open 90 degrees (1.57 rad). Where this section requires a minimum clear width of 32 inches (813 mm) and a door opening includes two door leaves without a mullion, one leaf shall provide a clear opening width of 32 inches (813 mm). The maximum width of a swinging door leaf shall be 48 inches (1219 mm) nominal. *Means of egress* doors in a Group I-2 occupancy used for the movement of beds shall provide a clear width not less than 41½ inches (1054 mm). The height of door openings shall be not less than 80 inches (2032 mm).

Exceptions:

1. The minimum and maximum width shall not apply to door openings that are not part of the required *means of egress* in Group R-2 and R-3 occupancies.

2. Door openings to resident *sleeping units* in Group I-3 occupancies shall have a clear width of not less than 28 inches (711 mm).
3. Door openings to storage closets less than 10 square feet (0.93 m²) in area shall not be limited by the minimum width.
4. Width of door leaves in revolving doors that comply with Section 1010.1.4.1 shall not be limited.
5. Door openings within a *dwelling unit* or *sleeping unit* shall be not less than 78 inches (1981 mm) in height.
6. Exterior door openings in *dwelling units* and *sleeping units*, other than the required *exit* door, shall be not less than 76 inches (1930 mm) in height.
7. In other than Group R-1 occupancies, the minimum widths shall not apply to interior egress doors within a *dwelling unit* or *sleeping unit* that is not required to be an *Accessible unit*, *Type A unit* or *Type B unit*.
8. Door openings required to be *accessible* within *Type B units* shall have a minimum clear width of 31.75 inches (806 mm).
9. Doors to walk-in freezers and coolers less than 1,000 square feet (93 m²) in area shall have a maximum width of 60 inches (1524 mm).
10. In Group R-1 *dwelling units* or *sleeping units* not required to be *Accessible units*, the minimum width shall not apply to doors for showers or saunas.

1010.1.1.1 Projections into clear width. There shall not be projections into the required clear width lower than 34 inches (864 mm) above the floor or ground. Projections into the clear opening width between 34 inches (864 mm) and 80 inches (2032 mm) above the floor or ground shall not exceed 4 inches (102 mm).

Exception: Door closers and door stops shall be permitted to be 78 inches (1980 mm) minimum above the floor.

1010.1.2 Door swing. Egress doors shall be of the pivoted or side-hinged swinging type.

Exceptions:

1. Private garages, office areas, factory and storage areas with an *occupant load* of 10 or less.
2. Group I-3 occupancies used as a place of detention.
3. Critical or intensive care patient rooms within suites of health care facilities.
4. Doors within or serving a single *dwelling unit* in Groups R-2 and R-3.
5. In other than Group H occupancies, revolving doors complying with Section 1010.1.4.1.

6. In other than Group H occupancies, special purpose horizontal sliding, accordion or folding door assemblies complying with Section 1010.1.4.3.
7. Power-operated doors in accordance with Section 1010.1.4.2.
8. Doors serving a bathroom within an individual *sleeping unit* in Group R-1.
9. In other than Group H occupancies, manually operated horizontal sliding doors are permitted in a *means of egress* from spaces with an *occupant load* of 10 or less.

1010.1.2.1 Direction of swing. Pivot or side-hinged swinging doors shall swing in the direction of egress travel where serving a room or area containing an occupant load of 50 or more persons or a Group H occupancy.

1010.1.3 Door opening force. The force for pushing or pulling open interior swinging egress doors, other than fire doors, shall not exceed 5 pounds (22 N). These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. For other swinging doors, as well as sliding and folding doors, the door latch shall release when subjected to a 15-pound (67 N) force. The door shall be set in motion when subjected to a 30-pound (133 N) force. The door shall swing to a full-open position when subjected to a 15-pound (67 N) force.

1010.1.3.1 Location of applied forces. Forces shall be applied to the latch side of the door.

1010.1.4 Special doors. Special doors and security grilles shall comply with the requirements of Sections 1010.1.4.1 through 1010.1.4.4.

1010.1.4.1 Revolving doors. Revolving doors shall comply with the following:

1. Revolving doors shall comply with BHMA A156.27 and shall be installed in accordance with the manufacturer's instructions.
2. Each revolving door shall be capable of *breakout* in accordance with BHMA A156.27 and shall provide an aggregate width of not less than 36 inches (914 mm).
3. A revolving door shall not be located within 10 feet (3048 mm) of the foot or top of *stairways* or escalators. A dispersal area shall be provided between the *stairways* or escalators and the revolving doors.
4. The revolutions per minute (rpm) for a revolving door shall not exceed the maximum rpm as specified in BHMA A156.27. Manual revolving doors shall comply with Table 1010.1.4.1(1). Automatic or power-operated revolving doors shall comply with Table 1010.1.4.1(2).
5. An emergency stop switch shall be provided near each entry point of power or automatic operated revolving doors within 48 inches (1220 mm) of the door and between 24 inches (610 mm) and 48

inches (1220 mm) above the floor. The activation area of the emergency stop switch button shall be not less than 1 inch (25 mm) in diameter and shall be red.

6. Each revolving door shall have a side-hinged swinging door that complies with Section 1010.1 in the same wall and within 10 feet (3048 mm) of the revolving door.
7. Revolving doors shall not be part of an *accessible route* required by Section 1009 and Chapter 11.

**TABLE 1010.1.4.1(1)
MAXIMUM DOOR SPEED MANUAL REVOLVING DOORS**

| REVOLVING DOOR MAXIMUM NOMINAL DIAMETER (FT-IN) | MAXIMUM ALLOWABLE REVOLVING DOOR SPEED (RPM) |
|--|---|
| 6-0 | 12 |
| 7-0 | 11 |
| 8-0 | 10 |
| 9-0 | 9 |
| 10-0 | 8 |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

**TABLE 1010.1.4.1(2)
MAXIMUM DOOR SPEED AUTOMATIC OR
POWER-OPERATED REVOLVING DOORS**

| REVOLVING DOOR MAXIMUM NOMINAL DIAMETER (FT-IN) | MAXIMUM ALLOWABLE REVOLVING DOOR SPEED (RPM) |
|--|---|
| 8-0 | 7.2 |
| 9-0 | 6.4 |
| 10-0 | 5.7 |
| 11-0 | 5.2 |
| 12-0 | 4.8 |
| 12-6 | 4.6 |
| 14-0 | 4.1 |
| 16-0 | 3.6 |
| 17-0 | 3.4 |
| 18-0 | 3.2 |
| 20-0 | 2.9 |
| 24-0 | 2.4 |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

1010.1.4.1.1 Egress component. A revolving door used as a component of a *means of egress* shall comply with Section 1010.1.4.1 and the following three conditions:

1. Revolving doors shall not be given credit for more than 50 percent of the minimum width or required capacity.
2. Each revolving door shall be credited with a capacity based on not more than a 50-person *occupant load*.
3. Each revolving door shall provide for egress in accordance with BHMA A156.27 with a *breakout* force of not more than 130 pounds (578 N).

1010.1.4.1.2 Other than egress component. A revolving door used as other than a component of a *means of egress* shall comply with Section 1010.1.4.1. The *breakout* force of a revolving door not used as a component of a *means of egress* shall not be more than 180 pounds (801 N).

Exception: A *breakout* force in excess of 180 pounds (801 N) is permitted if the collapsing force is reduced to not more than 130 pounds (578 N) when not less than one of the following conditions is satisfied:

1. There is a power failure or power is removed to the device holding the door wings in position.
2. There is an actuation of the *automatic sprinkler system* where such system is provided.
3. There is an actuation of a smoke detection system that is installed in accordance with Section 907 to provide coverage in areas within the building that are within 75 feet (22 860 mm) of the revolving doors.
4. There is an actuation of a manual control switch, in an approved location and clearly identified, that reduces the *breakout* force to not more than 130 pounds (578 N).

1010.1.4.2 Power-operated doors. Where *means of egress* doors are operated or assisted by power, the design shall be such that in the event of power failure, the door is capable of being opened manually to permit *means of egress* travel or closed where necessary to safeguard *means of egress*. The forces required to open these doors manually shall not exceed those specified in Section 1010.1.3, except that the force to set the door in motion shall not exceed 50 pounds (220 N). The door shall be capable of swinging open from any position to the full width of the opening in which such door is installed when a force is applied to the door on the side from which egress is made. Power-operated swinging doors, power-operated sliding doors and power-operated folding doors shall comply with BHMA A156.10. Power-assisted swinging doors and low-energy power-operated swinging doors shall comply with BHMA A156.19.

Exceptions:

1. Occupancies in Group I-3.
2. Horizontal sliding doors complying with Section 1010.1.4.3.
3. For a biparting door in the emergency breakout mode, a door leaf located within a multiple-leaf opening shall be exempt from the minimum 32-inch (813 mm) single-leaf requirement of Section 1010.1.1, provided a

minimum 32-inch (813 mm) clear opening is provided when the two biparting leaves meeting in the center are broken out.

1010.1.4.3 Special purpose horizontal sliding, accordion or folding doors. In other than Group H occupancies, special purpose horizontal sliding, accordion or folding door assemblies permitted to be a component of a *means of egress* in accordance with Exception 6 to Section 1010.1.2 shall comply with all of the following criteria:

1. The doors shall be power operated and shall be capable of being operated manually in the event of power failure.
2. The doors shall be openable by a simple method from both sides without special knowledge or effort.
3. The force required to operate the door shall not exceed 30 pounds (133 N) to set the door in motion and 15 pounds (67 N) to close the door or open it to the minimum required width.
4. The door shall be openable with a force not to exceed 15 pounds (67 N) when a force of 250 pounds (1100 N) is applied perpendicular to the door adjacent to the operating device.
5. The door assembly shall comply with the applicable *fire protection rating* and, where rated, shall be self-closing or automatic closing by smoke detection in accordance with Section 716.5.9.3, shall be installed in accordance with NFPA 80 and shall comply with Section 716.
6. The door assembly shall have an integrated standby power supply.
7. The door assembly power supply shall be electrically supervised.
8. The door shall open to the minimum required width within 10 seconds after activation of the operating device.

1010.1.4.4 Security grilles. In Groups B, F, M and S, horizontal sliding or vertical security grilles are permitted at the main *exit* and shall be openable from the inside without the use of a key or special knowledge or effort during periods that the space is occupied. The grilles shall remain secured in the full-open position during the period of occupancy by the general public. Where two or more *means of egress* are required, not more than one-half of the *exits* or *exit access doorways* shall be equipped with horizontal sliding or vertical security grilles.

1010.1.5 Floor elevation. There shall be a floor or landing on each side of a door. Such floor or landing shall be at the same elevation on each side of the door. Landings shall be level except for exterior landings, which are permitted to

have a slope not to exceed 0.25 unit vertical in 12 units horizontal (2-percent slope).

Exceptions:

1. Doors serving individual *dwelling units* in Groups R-2 and R-3 where the following apply:
 - 1.1. A door is permitted to open at the top step of an interior *flight of stairs*, provided the door does not swing over the top step.
 - 1.2. Screen doors and storm doors are permitted to swing over *stairs* or landings.
2. Exterior doors as provided for in Section 1003.5, Exception 1, and Section 1022.2, which are not on an *accessible route*.
3. In Group R-3 occupancies not required to be *Accessible units*, *Type A units* or *Type B units*, the landing at an exterior doorway shall be not more than $7\frac{3}{4}$ inches (197 mm) below the top of the threshold, provided the door, other than an exterior storm or screen door, does not swing over the landing.
4. Variations in elevation due to differences in finish materials, but not more than $\frac{1}{2}$ inch (12.7 mm).
5. Exterior decks, patios or balconies that are part of *Type B dwelling units*, have impervious surfaces and that are not more than 4 inches (102 mm) below the finished floor level of the adjacent interior space of the dwelling unit.
6. Doors serving equipment spaces not required to be *accessible* in accordance with Section 1103.2.9 and serving an occupant load of five or less shall be permitted to have a landing on one side to be not more than 7 inches (178 mm) above or below the landing on the egress side of the door.

1010.1.6 Landings at doors. Landings shall have a width not less than the width of the *stairway* or the door, whichever is greater. Doors in the fully open position shall not reduce a required dimension by more than 7 inches (178 mm). Where a landing serves an *occupant load* of 50 or more, doors in any position shall not reduce the landing to less than one-half its required width. Landings shall have a length measured in the direction of travel of not less than 44 inches (1118 mm).

Exception: Landing length in the direction of travel in Groups R-3 and U and within individual units of Group R-2 need not exceed 36 inches (914 mm).

1010.1.7 Thresholds. Thresholds at doorways shall not exceed $\frac{3}{4}$ inch (19.1 mm) in height above the finished floor or landing for sliding doors serving *dwelling units* or $\frac{1}{2}$ inch (12.7 mm) above the finished floor or landing for other doors. Raised thresholds and floor level changes greater than $\frac{1}{4}$ inch (6.4 mm) at doorways shall be beveled

with a slope not greater than one unit vertical in two units horizontal (50-percent slope).

Exceptions:

1. In occupancy Group R-2 or R-3, threshold heights for sliding and side-hinged exterior doors shall be permitted to be up to $7\frac{3}{4}$ inches (197 mm) in height if all of the following apply:
 - 1.1. The door is not part of the required *means of egress*.
 - 1.2. The door is not part of an *accessible route* as required by Chapter 11.
 - 1.3. The door is not part of an *Accessible unit*, *Type A unit* or *Type B unit*.
2. In *Type B units*, where Exception 5 to Section 1010.1.5 permits a 4-inch (102 mm) elevation change at the door, the threshold height on the exterior side of the door shall not exceed $4\frac{3}{4}$ inches (120 mm) in height above the exterior deck, patio or balcony for sliding doors or $4\frac{1}{2}$ inches (114 mm) above the exterior deck, patio or balcony for other doors.

1010.1.8 Door arrangement. Space between two doors in a series shall be 48 inches (1219 mm) minimum plus the width of a door swinging into the space. Doors in a series shall swing either in the same direction or away from the space between the doors.

Exceptions:

1. The minimum distance between horizontal sliding power-operated doors in a series shall be 48 inches (1219 mm).
2. Storm and screen doors serving individual *dwelling units* in Groups R-2 and R-3 need not be spaced 48 inches (1219 mm) from the other door.
3. Doors within individual *dwelling units* in Groups R-2 and R-3 other than within *Type A dwelling units*.

1010.1.9 Door operations. Except as specifically permitted by this section, egress doors shall be readily openable from the egress side without the use of a key or special knowledge or effort.

1010.1.9.1 Hardware. Door handles, pulls, latches, locks and other operating devices on doors required to be *accessible* by Chapter 11 shall not require tight grasping, tight pinching or twisting of the wrist to operate.

1010.1.9.2 Hardware height. Door handles, pulls, latches, locks and other operating devices shall be installed 34 inches (864 mm) minimum and 48 inches (1219 mm) maximum above the finished floor. Locks used only for security purposes and not used for normal operation are permitted at any height.

Exception: Access doors or gates in barrier walls and fences protecting pools, spas and hot tubs shall

be permitted to have operable parts of the release of latch on self-latching devices at 54 inches (1370 mm) maximum above the finished floor or ground, provided the self-latching devices are not also self-locking devices operated by means of a key, electronic opener or integral combination lock.

1010.1.9.3 Locks and latches. Locks and latches shall be permitted to prevent operation of doors where any of the following exist:

1. Places of detention or restraint.
2. In buildings in occupancy Group A having an *occupant load* of 300 or less, Groups B, F, M and S, and in *places of religious worship*, the main door or doors are permitted to be equipped with key-operated locking devices from the egress side provided:
 - 2.1. The locking device is readily distinguishable as locked.
 - 2.2. A readily visible durable sign is posted on the egress side on or adjacent to the door stating: THIS DOOR TO REMAIN UNLOCKED WHEN THIS SPACE IS OCCUPIED. The sign shall be in letters 1 inch (25 mm) high on a contrasting background.
 - 2.3. The use of the key-operated locking device is revocable by the *building official* for due cause.
3. Where egress doors are used in pairs, *approved* automatic flush bolts shall be permitted to be used, provided that the door leaf having the automatic flush bolts does not have a doorknob or surface-mounted hardware.
4. Doors from individual *dwelling* or *sleeping units* of Group R occupancies having an *occupant load* of 10 or less are permitted to be equipped with a night latch, dead bolt or security chain, provided such devices are openable from the inside without the use of a key or tool.
5. *Fire doors* after the minimum elevated temperature has disabled the unlatching mechanism in accordance with *listed fire door* test procedures.

1010.1.9.4 Bolt locks. Manually operated flush bolts or surface bolts are not permitted.

Exceptions:

1. On doors not required for egress in individual *dwelling units* or *sleeping units*.
2. Where a pair of doors serves a storage or equipment room, manually operated edge- or surface-mounted bolts are permitted on the inactive leaf.
3. Where a pair of doors serves an *occupant load* of less than 50 persons in a Group B, F or S occupancy, manually operated edge- or surface-mounted bolts are permitted on the inactive leaf.

The inactive leaf shall not contain doorknobs, panic bars or similar operating hardware.

4. Where a pair of doors serves a Group B, F or S occupancy, manually operated edge- or surface-mounted bolts are permitted on the inactive leaf provided such inactive leaf is not needed to meet egress capacity requirements and the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1. The inactive leaf shall not contain doorknobs, panic bars or similar operating hardware.
5. Where a pair of doors serves patient care rooms in Group I-2 occupancies, self-latching edge- or surface-mounted bolts are permitted on the inactive leaf provided that the inactive leaf is not needed to meet egress capacity requirements and the inactive leaf shall not contain doorknobs, panic bars or similar operating hardware.

1010.1.9.5 Unlatching. The unlatching of any door or leaf shall not require more than one operation.

Exceptions:

1. Places of detention or restraint.
2. Where manually operated bolt locks are permitted by Section 1010.1.9.4.
3. Doors with automatic flush bolts as permitted by Section 1010.1.9.3, Item 3.
4. Doors from individual *dwelling units* and *sleeping units* of Group R occupancies as permitted by Section 1010.1.9.3, Item 4.

1010.1.9.5.1 Closet and bathroom doors in Group R-4 occupancies. In Group R-4 occupancies, closet doors that latch in the closed position shall be openable from inside the closet, and bathroom doors that latch in the closed position shall be capable of being unlocked from the ingress side.

1010.1.9.5.2 Public toilet facility door locking. Where a *toilet room* is provided for the use of multiple occupants, the egress door for the room shall not be lockable from the inside of the room. This section does not apply to family or assisted-use *toilet rooms*.

1010.1.9.6 Controlled egress doors in Groups I-1 and I-2. Electric locking systems, including electro-mechanical locking systems and electromagnetic locking systems, shall be permitted to be locked in the means of egress in Group I-1 or I-2 occupancies where the clinical needs of persons receiving care require their containment. Controlled egress doors shall be permitted in such occupancies where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or an *approved automatic smoke* or *heat detection system* installed in accordance with Section 907, provided that the doors

are installed and operate in accordance with all of the following:

1. The door locks shall unlock on actuation of the *automatic sprinkler system* or *automatic fire detection system*.
2. The door locks shall unlock on loss of power controlling the lock or lock mechanism.
3. The door locking system shall be installed to have the capability of being unlocked by a switch located at the *fire command center*, a nursing station or other approved location. The switch shall directly break power to the lock.
4. A building occupant shall not be required to pass through more than one door equipped with a controlled egress locking system before entering an exit.
5. The procedures for unlocking the doors shall be described and approved as part of the emergency planning and preparedness required by Chapter 4 of the *Fire Code*.
6. All clinical staff shall have the keys, codes or other means necessary to operate the locking systems.
7. Emergency lighting shall be provided at the door.
8. The door locking system units shall be listed in accordance with UL 294.

Exceptions:

1. Items 1 through 4 shall not apply to doors to areas occupied by persons who, because of clinical needs, require restraint or containment as part of the function of a psychiatric treatment area.
2. Items 1 through 4 shall not apply to doors to areas where a *listed* egress control system is utilized to reduce the risk of child abduction from nursery and obstetric areas of a Group I-2 hospital.

1010.1.9.7 Delayed egress. Delayed egress locking systems shall be permitted to be installed on doors serving any occupancy except Group A and H in buildings that are equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or an *approved automatic smoke or heat detection system* installed in accordance with Section 907. The locking system shall be installed and operated in accordance with all of the following:

1. The delay electronics of the delayed egress locking system shall deactivate upon actuation of the *automatic sprinkler system* or *automatic fire detection system*, allowing immediate, free egress.
2. The delay electronics of the delayed egress locking system shall deactivate upon loss of power controlling the lock or lock mechanism, allowing immediate free egress.

3. The delayed egress locking system shall have the capability of being deactivated at the *fire command center* and other *approved* locations.
4. An attempt to egress shall initiate an irreversible process that shall allow such egress in not more than 15 seconds when a physical effort to exit is applied to the egress side door hardware for not more than 3 seconds. Initiation of the irreversible process shall activate an audible signal in the vicinity of the door. Once the delay electronics have been deactivated, rearming the delay electronics shall be by manual means only.

Exception: Where approved, a delay of not more than 30 seconds is permitted on a delayed egress door.

5. The egress path from any point shall not pass through more than one delayed egress locking system.

Exception: In Group I-2 or I-3 occupancies, the egress path from any point in the building shall pass through not more than two delayed egress locking systems provided the combined delay does not exceed 30 seconds.

6. A sign shall be provided on the door and shall be located above and within 12 inches (305 mm) of the door exit hardware:

6.1. For doors that swing in the direction of egress, the sign shall read: PUSH UNTIL ALARM SOUNDS. DOOR CAN BE OPENED IN 15 [30] SECONDS.

6.2. For doors that swing in the opposite direction of egress, the sign shall read: PULL UNTIL ALARM SOUNDS. DOOR CAN BE OPENED IN 15 [30] SECONDS.

6.3. The sign shall comply with the visual character requirements in ICC A117.1.

Exception: Where approved, in Group I occupancies, the installation of a sign is not required where care recipients who because of clinical needs require restraint or containment as part of the function of the treatment area.

7. Emergency lighting shall be provided on the egress side of the door.
8. The delayed egress locking system units shall be listed in accordance with UL 294.

1010.1.9.7.1 Delayed egress. Delayed egress locking systems are authorized to be installed on doors serving Group E in buildings that are equipped throughout with an *automatic fire alarm system* in accordance with Section 907.2.3. The locking system shall be installed and operated in accordance with all of the following:

1. The delay electronics of the delayed egress locking system shall deactivate upon actuation of the *automatic fire alarm system*, allowing immediate, free egress.

2. The delay electronics of the delayed egress locking system shall deactivate upon loss of power controlling the lock or lock mechanism, allowing immediate free egress.
 3. The delayed egress locking system shall have the capability of being deactivated at the *fire command center* and other *approved* locations, if a *fire command center* is provided.
 4. An attempt to egress shall initiate an irreversible process that shall allow such egress in not more than 15 seconds when a physical effort to exit is applied to the egress side door hardware for not more than 3 seconds. Initiation of the irreversible process shall activate an audible signal in the vicinity of the door. Once the delay electronics have been deactivated, rearming the delay electronics shall be by manual means only.
- Exception:** Where approved, a delay of not more than 30 seconds is permitted on a delayed egress door.
5. The egress path from any point shall not pass through more than one delayed egress locking system.
 6. A sign shall be provided on the door and shall be located above and within 12 inches (305 mm) of the door exit hardware:

- 6.1. For doors that swing in the direction of egress, the sign shall read: PUSH UNTIL ALARM SOUNDS. DOOR CAN BE OPENED IN 15 [30] SECONDS.
- 6.2. For doors that swing in the opposite direction of egress, the sign shall read: PULL UNTIL ALARM SOUNDS. DOOR CAN BE OPENED IN 15 [30] SECONDS.
- 6.3. The sign shall comply with the visual character requirements in ICC A117.

7. Emergency lighting shall be provided on the egress side of the door.
8. The delayed egress locking system units shall be listed in accordance with UL 294.

1010.1.9.8 Sensor release of electrically locked egress doors. The electric locks on sensor released doors located in a *means of egress* in buildings with an occupancy in Group A, B, E, I-1, I-2, I-4, M, R-1 or R-2 and entrance doors to tenant spaces in occupancies in Group A, B, E, I-1, I-2, I-4, M, R-1 or R-2 are permitted where installed and operated in accordance with all of the following criteria:

1. The sensor shall be installed on the egress side, arranged to detect an occupant approaching the doors. The doors shall be arranged to unlock by a signal from or loss of power to the sensor.
2. Loss of power to the lock or locking system shall automatically unlock the doors.

3. The doors shall be arranged to unlock from a manual unlocking device located 40 inches to 48 inches (1016 mm to 1219 mm) vertically above the floor and within 5 feet (1524 mm) of the secured doors. Ready access shall be provided to the manual unlocking device and the device shall be clearly identified by a sign that reads "PUSH TO EXIT." When operated, the manual unlocking device shall result in direct interruption of power to the lock—independent of other electronics—and the doors shall remain unlocked for not less than 30 seconds.
4. Activation of the building *fire alarm system*, where provided, shall automatically unlock the doors, and the doors shall remain unlocked until the fire alarm system has been reset.
5. Activation of the building *automatic sprinkler system* or *fire detection system*, where provided, shall automatically unlock the doors. The doors shall remain unlocked until the *fire alarm system* has been reset.
6. The door locking system units shall be listed in accordance with UL 294.

1010.1.9.9 Electromagnetically locked egress doors.

Doors in the *means of egress* in buildings with an occupancy in Group A, B, E, I-1, I-2, I-4, M, R-1 or R-2 and doors to tenant spaces in Group A, B, E, I-1, I-2, I-4, M, R-1 or R-2 shall be permitted to be locked with an electromagnetic locking system where equipped with hardware that incorporates a built-in switch and where installed and operated in accordance with all of the following:

1. The hardware that is affixed to the door leaf has an obvious method of operation that is readily operated under all lighting conditions.
2. The hardware is capable of being operated with one hand.
3. Operation of the hardware directly interrupts the power to the electromagnetic lock and unlocks the door immediately.
4. Loss of power to the locking system automatically unlocks the door.
5. Where *panic* or *fire exit hardware* is required by Section 1010.1.10, operation of the *panic* or *fire exit hardware* also releases the electromagnetic lock.
6. The locking system units shall be listed in accordance with UL 294.

1010.1.9.10 Locking arrangements in correctional facilities.

In occupancies in Groups A-2, A-3, A-4, B, E, F, I-2, I-3, M and S within correctional and detention facilities, doors in *means of egress* serving rooms or spaces occupied by persons whose movements are controlled for security reasons shall be permitted to be locked where equipped with egress control devices that

shall unlock manually and by not less than one of the following means:

1. Activation of an *automatic sprinkler system* installed in accordance with Section 903.3.1.1.
2. Activation of an *approved manual fire alarm box*.
3. A signal from a *constantly attended location*.

1010.1.9.11 Stairway doors. Interior *stairway means of egress* doors shall be openable from both sides without the use of a key or special knowledge or effort.

Exceptions:

1. *Stairway* discharge doors shall be openable from the egress side and shall only be locked from the opposite side.
2. This section shall not apply to doors arranged in accordance with Section 403.5.3.
3. In *stairways* serving not more than four stories, doors are permitted to be locked from the side opposite the egress side, provided they are openable from the egress side and capable of being unlocked simultaneously without unlatching upon a signal from the *fire command center*, if present, or upon a signal by emergency personnel from a single location inside the main entrance to the building.
4. *Stairway* exit doors shall be openable from the egress side and shall only be locked from the opposite side in Group B, F, M and S occupancies where the only interior access to the tenant space is from a single *exit stairway* where permitted in Section 1006.3.2.
5. *Stairway* exit doors shall be openable from the egress side and shall only be locked from the opposite side in Group R-2 occupancies where the only interior access to the *dwelling unit* is from a single *exit stairway* where permitted in Section 1006.3.2.
6. In buildings five or more stories in height, including existing buildings without a *fire command center* complying with Section 911, doors are permitted to be locked from the side opposite the egress side, provided they are unlocked without unlatching upon activation of the building's fire alarm system and the stairway is provided with a telephone or other two-way communication system in accordance with Section 403.5.3.

1010.1.9.12 Elevator lobby doors. Exit access doors in the elevator lobby serving a single Use Group B occupancy tenant are permitted to be equipped with an approved egress access control system when all of the following conditions are met:

1. The building is equipped throughout with either an *automatic sprinkler system* in accordance with Section 903.1.1 or an approved automatic smoke

or heat detection system installed in accordance with Section 907.

2. The elevator lobby exit access doors shall unlock upon loss of power to the access control system.
3. A readily accessible and visible manual unlocking device is installed 40 to 48 inches (1016 mm to 1219 mm) vertically above the floor and within 5 feet (1524 mm) horizontally of the secured doors, identified by a sign with minimum 1/2-inch (12.5 mm) high letters that reads "EMERGENCY DOOR RELEASE—ACTIVATE TO OPEN DOORS." Activation of the device shall unlock the doors for a minimum of 30 seconds.
4. Activation of the building fire alarm system, if provided, shall automatically unlock the doors, and the doors shall remain unlocked until the fire alarm system has been reset.
5. Activation of the building automatic sprinkler or fire detection system, if provided, shall automatically unlock the doors. The doors shall remain unlocked until the fire alarm system has been reset.
6. Where a manual fire alarm system is required by Section 907.2, a manual fire alarm box shall be provided and located within the elevator lobby.

1010.1.10 Panic and fire exit hardware. Doors serving a Group H occupancy and doors serving rooms or spaces with an *occupant load* of 50 or more in a Group A or E occupancy shall not be provided with a latch or lock other than *panic hardware* or *fire exit hardware*.

Exceptions:

1. A main *exit* of a Group A occupancy shall be permitted to be locking in accordance with Section 1010.1.9.3, Item 2.
2. Doors serving a Group A or E occupancy shall be permitted to be electromagnetically locked in accordance with Section 1010.1.9.9.

Electrical rooms with equipment rated 1,200 amperes or more and over 6 feet (1829 mm) wide, and that contain overcurrent devices, switching devices or control devices with *exit* or *exit access doors*, shall be equipped with *panic hardware* or *fire exit hardware*. The doors shall swing in the direction of egress travel.

1010.1.10.1 Installation. Where *panic* or *fire exit hardware* is installed, it shall comply with the following:

1. *Panic hardware* shall be *listed* in accordance with UL 305.
2. *Fire exit hardware* shall be *listed* in accordance with UL 10C and UL 305.
3. The actuating portion of the releasing device shall extend not less than one-half of the door leaf width.
4. The maximum unlatching force shall not exceed 15 pounds (67 N).

1010.1.10.2 Balanced doors. If *balanced doors* are used and *panic hardware* is required, the *panic hardware* shall be the push-pad type and the pad shall not extend more than one-half the width of the door measured from the latch side.

1010.2 Gates. Gates serving the *means of egress* system shall comply with the requirements of this section. Gates used as a component in a *means of egress* shall conform to the applicable requirements for doors.

Exception: Horizontal sliding or swinging gates exceeding the 4-foot (1219 mm) maximum leaf width limitation are permitted in fences and walls surrounding a stadium.

1010.2.1 Stadiums. *Panic hardware* is not required on gates surrounding stadiums where such gates are under constant immediate supervision while the public is present, and where safe dispersal areas based on 3 square feet (0.28 m²) per occupant are located between the fence and enclosed space. Such required safe dispersal areas shall not be located less than 50 feet (15 240 mm) from the enclosed space. See Section 1028.5 for *means of egress* from safe dispersal areas.

1010.3 Turnstiles. Turnstiles or similar devices that restrict travel to one direction shall not be placed so as to obstruct any required *means of egress*.

Exception: Each turnstile or similar device shall be credited with a capacity based on not more than a 50-person *occupant load* where all of the following provisions are met:

1. Each device shall turn free in the direction of egress travel when primary power is lost and on the manual release by an employee in the area.
2. Such devices are not given credit for more than 50 percent of the required egress capacity or width.
3. Each device is not more than 39 inches (991 mm) high.
4. Each device has not less than 16½ inches (419 mm) clear width at and below a height of 39 inches (991 mm) and not less than 22 inches (559 mm) clear width at heights above 39 inches (991 mm).

Where located as part of an *accessible route*, turnstiles shall have not less than 36 inches (914 mm) clear at and below a height of 34 inches (864 mm), not less than 32 inches (813 mm) clear width between 34 inches (864 mm) and 80 inches (2032 mm) and shall consist of a mechanism other than a revolving device.

1010.3.1 High turnstile. Turnstiles more than 39 inches (991 mm) high shall meet the requirements for revolving doors.

1010.3.2 Additional door. Where serving an *occupant load* greater than 300, each turnstile that is not portable shall have a side-hinged swinging door that conforms to Section 1010.1 within 50 feet (15 240 mm).

SECTION 1011 STAIRWAYS

1011.1 General. *Stairways* serving occupied portions of a building shall comply with the requirements of Sections 1011.2 through 1011.13. *Alternating tread devices* shall comply with Section 1011.14. Ship's ladders shall comply with Section 1011.15. Ladders shall comply with Section 1011.16.

Exception: Within rooms or spaces used for assembly purposes, stepped aisles shall comply with Section 1029.

1011.2 Width and capacity. The required capacity of *stairways* shall be determined as specified in Section 1005.1, but the minimum width shall be not less than 44 inches (1118 mm). See Section 1009.3 for accessible *means of egress stairways*.

Exceptions:

1. *Stairways* serving an *occupant load* of less than 50 shall have a width of not less than 36 inches (914 mm).
2. *Spiral stairways* as provided for in Section 1011.10.
3. Where an incline platform lift or stairway chairlift is installed on *stairways* serving occupancies in Group R-3, or within *dwelling units* in occupancies in Group R-2, a clear passage width not less than 20 inches (508 mm) shall be provided. Where the seat and platform can be folded when not in use, the distance shall be measured from the folded position.

1011.3 Headroom. *Stairways* shall have a headroom clearance of not less than 80 inches (2032 mm) measured vertically from a line connecting the edge of the *nosings*. Such headroom shall be continuous above the *stairway* to the point where the line intersects the landing below, one tread depth beyond the bottom riser. The minimum clearance shall be maintained the full width of the *stairway* and landing.

Exceptions:

1. *Spiral stairways* complying with Section 1011.10 are permitted a 78-inch (1981 mm) headroom clearance.
2. In Group R-3 occupancies; within *dwelling units* in Group R-2 occupancies; and in Group U occupancies that are accessory to a Group R-3 occupancy or accessory to individual *dwelling units* in Group R-2 occupancies; where the *nosings* of treads at the side of a *flight* extend under the edge of a floor opening through which the *stair* passes, the floor opening shall be allowed to project horizontally into the required headroom not more than 4¾ inches (121 mm).

1011.4 Walkline. The walkline across *winder* treads shall be concentric to the direction of travel through the turn and located 12 inches (305 mm) from the side where the *winders* are narrower. The 12-inch (305 mm) dimension shall be measured from the widest point of the clear *stair* width at the walking surface of the *winder*. Where *winders* are adjacent within the *flight*, the point of the widest clear *stair* width of the adjacent *winders* shall be used.

1011.5 Stair treads and risers. *Stair* treads and risers shall comply with Sections 1011.5.1 through 1011.5.5.3.

1011.5.1 Dimension reference surfaces. For the purpose of this section, all dimensions are exclusive of carpets, rugs or runners.

1011.5.2 Riser height and tread depth. *Stair* riser heights shall be 7 inches (178 mm) maximum and 4 inches (102 mm) minimum. The riser height shall be measured vertically between the *nosings* of adjacent treads. Rectangular tread depths shall be 11 inches (279 mm) minimum measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's *nosing*. *Winder* treads shall have a minimum tread depth of 11 inches (279 mm) between the vertical planes of the foremost projection of adjacent treads at the intersections with the walkline and a minimum tread depth of 10 inches (254 mm) within the clear width of the *stair*.

Exceptions:

1. *Spiral stairways* in accordance with Section 1011.10.
2. *Stairways* connecting stepped *aisles* to cross *aisles* or concourses shall be permitted to use the riser/tread dimension in Section 1029.13.2.
3. In Group R-3 occupancies; within *dwelling units* in Group R-2 occupancies; and in Group U occupancies that are accessory to a Group R-3 occupancy or accessory to individual *dwelling units* in Group R-2 occupancies; the maximum riser height shall be $7\frac{3}{4}$ inches (197 mm); the minimum tread depth shall be 10 inches (254 mm); the minimum *winder* tread depth at the walkline shall be 10 inches (254 mm); and the minimum *winder* tread depth shall be 6 inches (152 mm). A *nosing* projection not less than $\frac{3}{4}$ inch (19.1 mm) but not more than $1\frac{1}{4}$ inches (32 mm) shall be provided on *stairways* with solid risers where the tread depth is less than 11 inches (279 mm).
4. See Section 403.1 of the *Existing Building Code* for the replacement of existing *stairways*.
5. In Group I-3 facilities, *stairways* providing access to guard towers, observation stations and control rooms, not more than 250 square feet (23 m²) in area, shall be permitted to have a maximum riser height of 8 inches (203 mm) and a minimum tread depth of 9 inches (229 mm).

1011.5.3 Winder treads. *Winder* treads are not permitted in *means of egress stairways* except within a *dwelling unit*.

Exceptions:

1. Curved *stairways* in accordance with Section 1011.9.
2. *Spiral stairways* in accordance with Section 1011.10.

1011.5.4 Dimensional uniformity. *Stair* treads and risers shall be of uniform size and shape. The tolerance between the largest and smallest riser height or between the largest

and smallest tread depth shall not exceed $\frac{3}{8}$ inch (9.5 mm) in any *flight* of *stairs*. The greatest *winder* tread depth at the walkline within any *flight* of *stairs* shall not exceed the smallest by more than $\frac{3}{8}$ inch (9.5 mm).

Exceptions:

1. *Stairways* connecting stepped *aisles* to cross *aisles* or concourses shall be permitted to comply with the dimensional nonuniformity in Section 1029.13.2.
2. Consistently shaped *winders*, complying with Section 1011.5, differing from rectangular treads in the same *flight* of *stairs*.
3. Nonuniform riser dimension complying with Section 1011.5.4.1.

1011.5.4.1 Nonuniform height risers. Where the bottom or top riser adjoins a sloping *public way*, walkway or driveway having an established grade and serving as a landing, the bottom or top riser is permitted to be reduced along the slope to less than 4 inches (102 mm) in height, with the variation in height of the bottom or top riser not to exceed one unit vertical in 12 units horizontal (8-percent slope) of *stair* width. The *nosings* or leading edges of treads at such nonuniform height risers shall have a distinctive marking stripe, different from any other *nosing* marking provided on the *stair flight*. The distinctive marking stripe shall be visible in descent of the *stair* and shall have a slip-resistant surface. Marking stripes shall have a width of not less than 1 inch (25 mm) but not more than 2 inches (51 mm).

1011.5.5 Nosing and riser profile. *Nosings* shall have a curvature or bevel of not less than $\frac{1}{16}$ inch (1.6 mm) but not more than $\frac{9}{16}$ inch (14.3 mm) from the foremost projection of the tread. Risers shall be solid and vertical or sloped under the tread above from the underside of the *nosing* above at an angle not more than 30 degrees (0.52 rad) from the vertical.

1011.5.5.1 Nosing projection size. The leading edge (*nosings*) of treads shall project not more than $1\frac{1}{4}$ inches (32 mm) beyond the tread below.

1011.5.5.2 Nosing projection uniformity. *Nosing* projections of the leading edges shall be of uniform size, including the projections of the *nosing's* leading edge of the floor at the top of a *flight*.

1011.5.5.3 Solid risers. Risers shall be solid.

Exceptions:

1. Solid risers are not required for *stairways* that are not required to comply with Section 1009.3, provided that the opening between treads does not permit the passage of a sphere with a diameter of 4 inches (102 mm).
2. Solid risers are not required for occupancies in Group I-3 or in Group F, H and S occupancies other than areas accessible to the public. There are no restrictions on the size of the opening in the riser.

3. Solid risers are not required for *spiral stairways* constructed in accordance with Section 1011.10.

1011.6 Stairway landings. There shall be a floor or landing at the top and bottom of each *stairway*. The width of landings shall be not less than the width of *stairways* served. Every landing shall have a minimum width measured perpendicular to the direction of travel equal to the width of the *stairway*. Where the *stairway* has a straight run the depth need not exceed 48 inches (1219 mm). Doors opening onto a landing shall not reduce the landing to less than one-half the required width. When fully open, the door shall not project more than 7 inches (178 mm) into a landing. Where *wheelchair spaces* are required on the *stairway* landing in accordance with Section 1009.6.3, the *wheelchair space* shall not be located in the required width of the landing and doors shall not swing over the *wheelchair spaces*.

Exception: Where *stairways* connect stepped *aisles* to cross *aisles* or concourses, *stairway* landings are not required at the transition between *stairways* and stepped *aisles* constructed in accordance with Section 1029.

1011.7 Stairway construction. *Stairways* shall be built of materials consistent with the types permitted for the type of construction of the building, except that wood *handrails* shall be permitted for all types of construction.

1011.7.1 Stairway walking surface. The walking surface of treads and landings of a *stairway* shall not be sloped steeper than one unit vertical in 48 units horizontal (2-percent slope) in any direction. *Stairway* treads and landings shall have a solid surface. Finish floor surfaces shall be securely attached.

Exceptions:

1. Openings in *stair* walking surfaces shall be a size that does not permit the passage of $\frac{1}{2}$ -inch-diameter (12.7 mm) sphere. Elongated openings shall be placed so that the long dimension is perpendicular to the direction of travel.
2. In Group F, H and S occupancies, other than areas of parking structures accessible to the public, openings in treads and landings shall not be prohibited provided a sphere with a diameter of $\frac{1}{8}$ inches (29 mm) cannot pass through the opening.

1011.7.2 Outdoor conditions. Outdoor *stairways* and outdoor approaches to *stairways* shall be designed so that water will not accumulate on walking surfaces.

1011.7.3 Enclosures under interior stairways. The walls and soffits within enclosed usable spaces under enclosed and unenclosed stairways shall be protected by 1-hour fire-resistance-rated construction or the fire-resistance rating of the stairway enclosure, whichever is greater. Access to the enclosed space shall not be directly from within the stairway enclosure.

Exception: Spaces under *stairways* serving and contained within a single residential dwelling unit in Group R-2 or R-3 shall be permitted to be protected on the enclosed side with $\frac{1}{2}$ -inch (12.7 mm) gypsum board.

1011.7.4 Enclosures under exterior stairways. There shall not be enclosed usable space under *exterior exit stairways* unless the space is completely enclosed in 1-hour fire-resistance-rated construction. The open space under *exterior stairways* shall not be used for any purpose.

1011.8 Vertical rise. A flight of stairs shall not have a vertical rise greater than 12 feet (3658 mm) between floor levels or landings.

Exception: Spiral stairways used as a means of egress from technical production areas.

1011.9 Curved stairways. Curved stairways with winder treads shall have treads and risers in accordance with Section 1011.5 and the smallest radius shall be not less than twice the minimum width or required capacity of the stairway.

Exception: The radius restriction shall not apply to curved stairways in Group R-3 and within individual dwelling units in Group R-2.

1011.10 Spiral stairways. *Spiral stairways* are permitted to be used as a component in the *means of egress* only within *dwelling units* or from a space not more than 250 square feet (23 m²) in area and serving not more than five occupants, or from *technical production areas* in accordance with Section 410.6.

A *spiral stairway* shall have a $7\frac{1}{2}$ -inch (191 mm) minimum clear tread depth at a point 12 inches (305 mm) from the narrow edge. The risers shall be sufficient to provide a headroom of 78 inches (1981 mm) minimum, but riser height shall not be more than $9\frac{1}{2}$ inches (241 mm). The minimum *stairway* clear width at and below the *handrail* shall be 26 inches (660 mm).

1011.11 Handrails. *Stairways* shall have *handrails* on each side and shall comply with Section 1014. Where glass is used to provide the *handrail*, the *handrail* shall comply with Section 2407.

Exceptions:

1. *Stairways* within dwelling units and *spiral stairways* are permitted to have a *handrail* on one side only.
2. Decks, patios and walkways that have a single change in elevation where the landing depth on each side of the change of elevation is greater than what is required for a landing do not require *handrails*.
3. In Group R-3 occupancies, a change in elevation consisting of a single riser at an entrance or egress door does not require *handrails*.
4. Changes in room elevations of three or fewer risers within dwelling units and sleeping units in Group R-2 and R-3 do not require *handrails*.

1011.12 Stairway to roof. In buildings four or more stories above *grade plane*, one *stairway* shall extend to the roof surface unless the roof has a slope steeper than four units vertical in 12 units horizontal (33-percent slope).

Exception: Other than where required by Section 1011.12.1, in buildings without an occupied roof access to the roof from the top story shall be permitted to be by an

alternating tread device, a ship's ladder or a permanent ladder.

1011.12.1 Stairway to elevator equipment. Roofs and penthouses containing elevator equipment that must be accessed for maintenance are required to be accessed by a stairway.

1011.12.2 Roof access. Where a stairway is provided to a roof, access to the roof shall be provided through a penthouse complying with Section 1510.2.

Exception: In buildings without an occupied roof, access to the roof shall be permitted to be a roof hatch or trap door not less than 16 square feet (1.5 m²) in area and having a minimum dimension of 2 feet (610 mm).

1011.13 Guards. Guards shall be provided along stairways and landings where required by Section 1015 and shall be constructed in accordance with Section 1015. Where the roof hatch opening providing the required access is located within 10 feet (3049 mm) of the roof edge, such roof access or roof edge shall be protected by guards installed in accordance with Section 1015.

1011.14 Alternating tread devices. *Alternating tread devices* are limited to an element of a *means of egress* in buildings of Groups F, H and S from a mezzanine not more than 250 square feet (23 m²) in area and that serves not more than five occupants; in buildings of Group I-3 from a guard tower, observation station or control room not more than 250 square feet (23 m²) in area and for access to unoccupied roofs. *Alternating tread devices* used as a means of egress shall not have a rise greater than 20 feet (6096 mm) between floor levels or landings.

1011.14.1 Handrails of alternating tread devices. Handrails shall be provided on both sides of alternating tread devices and shall comply with Section 1014.

1011.14.2 Treads of alternating tread devices. *Alternating tread devices* shall have a minimum tread depth of 5 inches (127 mm), a minimum projected tread depth of 8½ inches (216 mm), a minimum tread width of 7 inches (178 mm) and a maximum riser height of 9½ inches (241 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projections of adjacent treads. The riser height shall be measured vertically between the leading edges of adjacent treads. The riser height and tread depth provided shall result in an angle of ascent from the horizontal of between 50 and 70 degrees (0.87 and 1.22 rad). The initial tread of the device shall begin at the same elevation as the platform, landing or floor surface.

Exception: *Alternating tread devices* used as an element of a *means of egress* in buildings from a mezzanine area not more than 250 square feet (23 m²) in area that serves not more than five occupants shall have a minimum tread depth of 3 inches (76 mm) with a minimum projected tread depth of 10½ inches (267 mm). The rise to the next alternating tread surface shall not exceed 8 inches (203 mm).

1011.15 Ship's ladders. Ship's ladders are permitted to be used in Group I-3 as a component of a *means of egress* to and

from control rooms or elevated facility observation stations not more than 250 square feet (23 m²) with not more than three occupants and for access to unoccupied roofs. The minimum clear width at and below the *handrails* shall be 20 inches (508 mm).

1011.15.1 Handrails of ship's ladders. *Handrails* shall be provided on both sides of ship's ladders.

1011.15.2 Treads of ship's ladders. Ship's ladders shall have a minimum tread depth of 5 inches (127 mm). The tread shall be projected such that the total of the tread depth plus the *nosing* projection is not less than 8½ inches (216 mm). The maximum riser height shall be 9½ inches (241 mm).

1011.16 Ladders. Permanent ladders shall not serve as a part of the *means of egress* from occupied spaces within a building. Permanent ladders shall be permitted to provide access to the following areas:

1. Spaces frequented only by personnel for maintenance, repair or monitoring of equipment.
2. Nonoccupiable spaces accessed only by catwalks, crawl spaces, freight elevators or very narrow passageways.
3. Raised areas used primarily for purposes of security, life safety or fire safety including, but not limited to, observation galleries, prison guard towers, fire towers or lifeguard stands.
4. Elevated levels in Group U not open to the general public.
5. Nonoccupied roofs that are not required to have *stairway* access in accordance with Section 1011.12.1.
6. Ladders shall be constructed in accordance with Section 306.5 of the *Mechanical Code*.

SECTION 1012 RAMPS

1012.1 Scope. The provisions of this section shall apply to ramps used as a component of a *means of egress*.

Exceptions:

1. Ramped *aisles* within assembly rooms or spaces shall comply with the provisions in Section 1029.
2. Curb ramps shall comply with ICC A117.1.
3. Vehicle ramps in parking garages for pedestrian *exit access* shall not be required to comply with Sections 1012.3 through 1012.10 where they are not an *accessible route* serving *accessible* parking spaces, other required *accessible* elements or part of an accessible *means of egress*.

1012.2 Slope. *Ramps* used as part of a *means of egress* shall have a running slope not steeper than one unit vertical in 12 units horizontal (8-percent slope). The slope of other pedestrian *ramps* shall not be steeper than one unit vertical in eight units horizontal (12.5-percent slope).

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1012.3 Cross slope. The slope measured perpendicular to the direction of travel of a *ramp* shall not be steeper than one unit vertical in 48 units horizontal (2-percent slope).

1012.4 Vertical rise. The rise for any *ramp* run shall be 30 inches (762 mm) maximum.

1012.5 Minimum dimensions. The minimum dimensions of *means of egress ramps* shall comply with Sections 1012.5.1 through 1012.5.3.

1012.5.1 Width and capacity. The minimum width and required capacity of a *means of egress ramp* shall be not less than that required for *corridors* by Section 1020.2. The clear width of a *ramp* between *handrails*, if provided, or other permissible projections shall be 36 inches (914 mm) minimum.

1012.5.2 Headroom. The minimum headroom in all parts of the *means of egress ramp* shall be not less than 80 inches (2032 mm).

1012.5.3 Restrictions. *Means of egress ramps* shall not reduce in width in the direction of egress travel. Projections into the required *ramp* and landing width are prohibited. Doors opening onto a landing shall not reduce the clear width to less than 42 inches (1067 mm).

1012.6 Landings. *Ramps* shall have landings at the bottom and top of each *ramp*, points of turning, entrance, exits and at doors. Landings shall comply with Sections 1012.6.1 through 1012.6.5.

1012.6.1 Slope. Landings shall have a slope not steeper than one unit vertical in 48 units horizontal (2-percent slope) in any direction. Changes in level are not permitted.

1012.6.2 Width. The landing width shall be not less than the width of the widest *ramp* run adjoining the landing.

1012.6.3 Length. The landing length shall be 60 inches (1525 mm) minimum.

Exceptions:

1. In Group R-2 and R-3 individual *dwelling* and *sleeping units* that are not required to be *Accessible units*, *Type A units* or *Type B units* in accordance with Section 1107, landings are permitted to be 36 inches (914 mm) minimum.
2. Where the *ramp* is not a part of an *accessible route*, the length of the landing shall not be required to be more than 48 inches (1220 mm) in the direction of travel.

1012.6.4 Change in direction. Where changes in direction of travel occur at landings provided between *ramp* runs, the landing shall be 60 inches by 60 inches (1524 mm by 1524 mm) minimum.

Exception: In Group R-2 and R-3 individual *dwelling* or *sleeping units* that are not required to be *Accessible units*, *Type A units* or *Type B units* in accordance with Section 1107, landings are permitted to be 36 inches by 36 inches (914 mm by 914 mm) minimum.

1012.6.5 Doorways. Where doorways are located adjacent to a *ramp* landing, maneuvering clearances required by

ICC A117.1 are permitted to overlap the required landing area.

1012.7 Ramp construction. *Ramps* shall be built of materials consistent with the types permitted for the type of construction of the building, except that wood *handrails* shall be permitted for all types of construction.

1012.7.1 Ramp surface. The surface of *ramps* shall be of slip-resistant materials that are securely attached.

1012.7.2 Outdoor conditions. Outdoor *ramps* and outdoor approaches to *ramps* shall be designed so that water will not accumulate on walking surfaces.

1012.8 Handrails. *Ramps* with a rise greater than 6 inches (152 mm) shall have *handrails* on both sides. *Handrails* shall comply with Section 1014.

1012.9 Guards. *Guards* shall be provided where required by Section 1015 and shall be constructed in accordance with Section 1015.

1012.10 Edge protection. Edge protection complying with Section 1012.10.1 or 1012.10.2 shall be provided on each side of *ramp* runs and at each side of *ramp* landings.

Exceptions:

1. Edge protection is not required on *ramps* that are not required to have *handrails*, provided they have flared sides that comply with the *ICC A117.1* curb ramp provisions.
2. Edge protection is not required on the sides of *ramp* landings serving an adjoining *ramp* run or *stairway*.
3. Edge protection is not required on the sides of *ramp* landings having a vertical dropoff of not more than $\frac{1}{2}$ inch (12.7 mm) within 10 inches (254 mm) horizontally of the required landing area.

1012.10.1 Curb, rail, wall or barrier. A curb, rail, wall or barrier shall be provided to serve as edge protection. A curb shall be not less than 4 inches (102 mm) in height. Barriers shall be constructed so that the barrier prevents the passage of a 4-inch-diameter (102 mm) sphere, where any portion of the sphere is within 4 inches (102 mm) of the floor or ground surface.

1012.10.2 Extended floor or ground surface. The floor or ground surface of the *ramp* run or landing shall extend 12 inches (305 mm) minimum beyond the inside face of a *handrail* complying with Section 1014.

SECTION 1013 EXIT SIGNS

1013.1 Where required. *Exits* and *exit access* doors shall be marked by an *approved* exit sign readily visible from any direction of egress travel. The path of egress travel to *exits* and within *exits* shall be marked by readily visible exit signs to clearly indicate the direction of egress travel in cases where the *exit* or the path of egress travel is not immediately visible to the occupants. Intervening *means of egress* doors within *exits* shall be marked by exit signs. Exit sign placement shall be such that no point in an *exit access corridor* or

exit passageway is more than 100 feet (30 480 mm) or the *listed* viewing distance for the sign, whichever is less, from the nearest visible exit sign.

Exceptions:

1. Exit signs are not required in rooms or areas that require only one *exit* or *exit access*.
2. Main exterior *exit* doors or gates that are obviously and clearly identifiable as *exits* need not have exit signs where *approved* by the *building official*.
3. Exit signs are not required in occupancies in Group U and individual *sleeping units* or *dwelling units* in Group R-1, R-2 or R-3.
4. Exit signs are not required in dayrooms, sleeping rooms or dormitories in occupancies in Group I-3.
5. In occupancies in Groups A-4 and A-5, exit signs are not required on the seating side of vomitories or openings into seating areas where exit signs are provided in the concourse that are readily apparent from the vomitories. Egress lighting is provided to identify each vomitory or opening within the seating area in an emergency.

1013.2 Floor-level exit signs in Group R-1. Where exit signs are required in Group R-1 occupancies by Section 1013.1, additional low-level exit signs shall be provided in all areas serving guest rooms in Group R-1 occupancies and shall comply with Section 1013.5.

The bottom of the sign shall be not less than 10 inches (254 mm) nor more than 12 inches (305 mm) above the floor level. The sign shall be flush mounted to the door or wall. Where mounted on the wall, the edge of the sign shall be within 4 inches (102 mm) of the door frame on the latch side.

1013.3 Illumination. Exit signs shall be internally or externally illuminated.

Exception: Tactile signs required by Section 1013.4 need not be provided with illumination.

1013.4 Raised character and braille exit signs. A sign stating EXIT in visual characters, raised characters and braille and complying with *ICC A117.1* shall be provided adjacent to each door to an *area of refuge*, an exterior area for assisted rescue, an *exit stairway* or *ramp*, an *exit passageway* and the *exit discharge*.

1013.5 Internally illuminated exit signs. Electrically powered, *self-luminous* and *photoluminescent* exit signs shall be *listed* and *labeled* in accordance with UL 924 and shall be installed in accordance with the manufacturer's instructions and Chapter 27. Exit signs shall be illuminated at all times.

1013.6 Externally illuminated exit signs. Externally illuminated exit signs shall comply with Sections 1013.6.1 through 1013.6.3.

1013.6.1 Graphics. Every exit sign and directional exit sign shall have plainly legible letters not less than 6 inches (152 mm) high with the principal strokes of the letters not less than $\frac{3}{4}$ inch (19.1 mm) wide. The word "EXIT" shall have letters having a width not less than 2 inches (51 mm) wide, except the letter "I," and the minimum spacing

between letters shall be not less than $\frac{3}{8}$ inch (9.5 mm). Signs larger than the minimum established in this section shall have letter widths, strokes and spacing in proportion to their height.

The word "EXIT" shall be in high contrast with the background and shall be clearly discernible when the means of exit sign illumination is or is not energized. If a chevron directional indicator is provided as part of the exit sign, the construction shall be such that the direction of the chevron directional indicator cannot be readily changed.

1013.6.2 Exit sign illumination. The face of an exit sign illuminated from an external source shall have an intensity of not less than 5 footcandles (54 lux).

1013.6.3 Power source. Exit signs shall be illuminated at all times. To ensure continued illumination for a duration of not less than 90 minutes in case of primary power loss, the sign illumination means shall be connected to an emergency power system provided from storage batteries, unit equipment or an on-site generator. The installation of the emergency power system shall be in accordance with Chapter 27.

Exceptions:

1. *Approved* exit sign illumination means that provide continuous illumination independent of external power sources for a duration of not less than 90 minutes, in case of primary power loss, are not required to be connected to an emergency electrical system.
2. Group I-2 Condition 2 exit sign illumination shall not be provided by unit equipment battery only.

SECTION 1014 HANDRAILS

1014.1 Where required. *Handrails* serving *stairways*, *ramps*, stepped *aisles* and ramped *aisles* shall be adequate in strength and attachment in accordance with Section 1607.8. *Handrails* required for *stairways* by Section 1011.11 shall comply with Sections 1014.2 through 1014.9. *Handrails* required for *ramps* by Section 1012.8 shall comply with Sections 1014.2 through 1014.8. *Handrails* for stepped *aisles* and ramped *aisles* required by Section 1029.15 shall comply with Sections 1014.2 through 1014.8.

1014.2 Height. *Handrail* height, measured above *stair tread nosings*, or finish surface of *ramp* slope, shall be uniform, not less than 34 inches (864 mm) and not more than 38 inches (965 mm). *Handrail* height of *alternating tread devices* and ship's ladders, measured above tread *nosings*, shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

Exceptions:

1. Where handrail fittings or bendings are used to provide continuous transition between *flights*, the fittings or bendings shall be permitted to exceed the maximum height.

2. In Group R-3 occupancies; within *dwelling units* in Group R-2 occupancies; and in Group U occupancies that are associated with a Group R-3 occupancy or associated with individual *dwelling units* in Group R-2 occupancies; where handrail fittings or bendings are used to provide continuous transition between *flights*, transition at *winder* treads, transition from *handrail* to *guard*, or where used at the start of a *flight*, the *handrail* height at the fittings or bendings shall be permitted to exceed the maximum height.
3. *Handrails* on top of a guard where permitted along stepped aisles and ramped aisles in accordance with Section 1029.15.

1014.3 Handrail graspability. Required *handrails* shall comply with Section 1014.3.1 or shall provide equivalent graspability.

Exception: In Group R-3 occupancies; within *dwelling units* in Group R-2 occupancies; and in Group U occupancies that are accessory to a Group R-3 occupancy or accessory to individual *dwelling units* in Group R-2 occupancies; *handrails* shall be Type I in accordance with Section 1014.3.1, Type II in accordance with Section 1014.3.2 or shall provide equivalent graspability.

1014.3.1 Type I. *Handrails* with a circular cross section shall have an outside diameter of not less than 1 $\frac{1}{4}$ inches (32 mm) and not greater than 2 inches (51 mm). Where the *handrail* is not circular, it shall have a perimeter dimension of not less than 4 inches (102 mm) and not greater than 6 $\frac{1}{4}$ inches (160 mm) with a maximum cross-sectional dimension of 2 $\frac{1}{4}$ inches (57 mm) and minimum cross-sectional dimension of 1 inch (25 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm).

1014.3.2 Type II. *Handrails* with a perimeter greater than 6 $\frac{1}{4}$ inches (160 mm) shall provide a graspable finger recess area on both sides of the profile. The finger recess shall begin within a distance of $\frac{3}{4}$ inch (19 mm) measured vertically from the tallest portion of the profile and achieve a depth of not less than $\frac{5}{16}$ inch (8 mm) within $\frac{7}{8}$ inch (22 mm) below the widest portion of the profile. This required depth shall continue for not less than $\frac{3}{8}$ inch (10 mm) to a level that is not less than 1 $\frac{3}{4}$ inches (45 mm) below the tallest portion of the profile. The width of the *handrail* above the recess shall be not less than 1 $\frac{1}{4}$ inches (32 mm) to not greater than 2 $\frac{3}{4}$ inches (70 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm).

1014.4 Continuity. Handrail gripping surfaces shall be continuous, without interruption by newel posts or other obstructions.

Exceptions:

1. *Handrails* within *dwelling units* are permitted to be interrupted by a newel post at a turn or landing.
2. Within a *dwelling unit*, the use of a volute, turnout, starting easing or starting newel is allowed over the lowest tread.
3. Handrail brackets or balusters attached to the bottom surface of the *handrail* that do not project horizon-

tally beyond the sides of the *handrail* within 1 $\frac{1}{2}$ inches (38 mm) of the bottom of the *handrail* shall not be considered obstructions. For each $\frac{1}{2}$ inch (12.7 mm) of additional handrail perimeter dimension above 4 inches (102 mm), the vertical clearance dimension of 1 $\frac{1}{2}$ inches (38 mm) shall be permitted to be reduced by $\frac{1}{8}$ inch (3.2 mm).

4. Where *handrails* are provided along walking surfaces with slopes not steeper than 1:20, the bottoms of the handrail gripping surfaces shall be permitted to be obstructed along their entire length where they are integral to crash rails or bumper guards.
5. *Handrails* serving stepped *aisles* or ramped *aisles* are permitted to be discontinuous in accordance with Section 1029.15.1.

1014.5 Fittings. *Handrails* shall not rotate within their fittings.

1014.6 Handrail extensions. *Handrails* shall return to a wall, *guard* or the walking surface or shall be continuous to the handrail of an adjacent *flight* of *stairs* or *ramp* run. Where *handrails* are not continuous between *flights*, the *handrails* shall extend horizontally not less than 12 inches (305 mm) beyond the top riser and continue to slope for the depth of one tread beyond the bottom riser. At *ramps* where *handrails* are not continuous between runs, the *handrails* shall extend horizontally above the landing 12 inches (305 mm) minimum beyond the top and bottom of *ramp* runs. The extensions of *handrails* shall be in the same direction of the *flights* of *stairs* at *stairways* and the *ramp* runs at *ramps*.

Exceptions:

1. *Handrails* within a *dwelling unit* that is not required to be *accessible* need extend only from the top riser to the bottom riser.
2. *Handrails* serving aisles in rooms or spaces used for assembly purposes are permitted to comply with the handrail extensions in accordance with Section 1029.15.
3. *Handrails* for *alternating tread devices* and ship's ladders are permitted to terminate at a location vertically above the top and bottom risers. *Handrails* for *alternating tread devices* are not required to be continuous between *flights* or to extend beyond the top or bottom risers.

1014.7 Clearance. Clear space between a handrail and a wall or other surface shall be not less than 1 $\frac{1}{2}$ inches (38 mm). A handrail and a wall or other surface adjacent to the *handrail* shall be free of any sharp or abrasive elements.

1014.8 Projections. On *ramps* and on ramped *aisles* that are part of an *accessible route*, the clear width between *handrails* shall be 36 inches (914 mm) minimum. Projections into the required width of *aisles*, *stairways* and *ramps* at each side shall not exceed 4 $\frac{1}{2}$ inches (114 mm) at or below the handrail height. Projections into the required width shall not be limited above the minimum headroom height required in Section 1011.3. Projections due to intermediate *handrails* shall not constitute a reduction in the egress width. Where a pair of intermediate *handrails* are provided within the *stairway*

width without a walking surface between the pair of intermediate *handrails* and the distance between the pair of intermediate *handrails* is greater than 6 inches (152 mm), the available egress width shall be reduced by the distance between the closest edges of each such intermediate pair of *handrails* that is greater than 6 inches (152 mm).

1014.9 Intermediate handrails. *Stairways* shall have intermediate *handrails* located in such a manner that all portions of the *stairway* minimum width or required capacity are within 30 inches (762 mm) of a handrail. On monumental *stairs*, *handrails* shall be located along the most direct path of egress travel.

SECTION 1015 GUARDS

1015.1 General. *Guards* shall comply with the provisions of Sections 1015.2 through 1015.7. Operable windows with sills located more than 72 inches (1829 mm) above finished grade or other surface below shall comply with Section 1015.8.

1015.2 Where required. *Guards* shall be located along open-sided walking surfaces, including *mezzanines*, *equipment platforms*, *aisles*, *stairs*, *ramps* and landings that are located more than 30 inches (762 mm) measured vertically to the floor or grade below at any point within 36 inches (914 mm) horizontally to the edge of the open side. *Guards* shall be adequate in strength and attachment in accordance with Section 1607.8.

Exception: *Guards* are not required for the following locations:

1. On the loading side of loading docks or piers.
2. On the audience side of *stages* and raised *platforms*, including *stairs* leading up to the *stage* and raised *platforms*.
3. On raised *stage* and *platform* floor areas, such as runways, *ramps* and side *stages* used for entertainment or presentations.
4. At vertical openings in the performance area of *stages* and *platforms*.
5. At elevated walking surfaces appurtenant to *stages* and *platforms* for access to and utilization of special lighting or equipment.
6. Along vehicle service pits not accessible to the public.
7. In assembly seating areas at cross aisles in accordance with Section 1029.16.2.

1015.2.1 Glazing. Where glass is used to provide a *guard* or as a portion of the *guard* system, the *guard* shall comply with Section 2407. Where the glazing provided does not meet the strength and attachment requirements of Section 1607.8, complying *guards* shall be located along glazed sides of open-sided walking surfaces.

1015.3 Height. Required *guards* shall be not less than 42 inches (1067 mm) high, measured vertically as follows:

1. From the adjacent walking surfaces.

2. On *stairways* and stepped *aisles*, from the line connecting the leading edges of the tread *nosings*.
3. On *ramps* and ramped *aisles*, from the *ramp* surface at the *guard*.

Exceptions:

1. For occupancies in Group R-3 not more than three stories above grade in height and within individual *dwelling units* in occupancies in Group R-2 not more than three stories above grade in height with separate *means of egress*, required *guards* shall be not less than 36 inches (914 mm) in height measured vertically above the adjacent walking surfaces or adjacent *fixed seating*.
2. For occupancies in Group R-3, and within individual *dwelling units* in occupancies in Group R-2, *guards* on the open sides of *stairs* shall have a height not less than 34 inches (864 mm) measured vertically from a line connecting the leading edges of the treads.
3. For occupancies in Group R-3, and within individual *dwelling units* in occupancies in Group R-2, where the top of the *guard* also serves as a *handrail* on the open sides of *stairs*, the top of the *guard* shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm) measured vertically from a line connecting the leading edges of the treads.
4. The *guard* height in assembly seating areas shall comply with Section 1029.16 as applicable.
5. Along *alternating tread devices* and ship's ladders, *guards* where the top rail also serves as a *handrail* shall have height not less than 30 inches (762 mm) and not more than 34 inches (864 mm), measured vertically from the leading edge of the device tread *nosings*.

1015.4 Opening limitations. Required *guards* shall not have openings that allow passage of a sphere 4 inches (102 mm) in diameter from the walking surface to the required *guard* height.

Exceptions:

1. From a height of 36 inches (914 mm) to 42 inches (1067 mm), *guards* shall not have openings that allow passage of a sphere $4\frac{3}{8}$ inches (111 mm) in diameter.
2. The triangular openings at the open sides of a *stair*, formed by the riser, tread and bottom rail shall not allow passage of a sphere 6 inches (152 mm) in diameter.
3. At elevated walking surfaces for access to and use of electrical, mechanical or plumbing systems or equipment, *guards* shall not have openings that allow passage of a sphere 21 inches (533 mm) in diameter.
4. In areas that are not open to the public within occupancies in Group I-3, F, H or S, and for *alternating tread devices* and ship's ladders, *guards* shall not

have openings that allow passage of a sphere 21 inches (533 mm) in diameter.

5. In assembly seating areas, *guards* required at the end of aisles in accordance with Section 1029.16.4 shall not have openings that allow passage of a sphere 4 inches (102 mm) in diameter up to a height of 26 inches (660 mm). From a height of 26 inches (660 mm) to 42 inches (1067 mm) above the adjacent walking surfaces, *guards* shall not have openings that allow passage of a sphere 8 inches (203 mm) in diameter.
6. Within individual *dwelling units* and *sleeping units* in Group R-2 and R-3 occupancies, *guards* on the open sides of *stairs* shall not have openings that allow passage of a sphere $4\frac{3}{8}$ (111 mm) inches in diameter.

1015.5 Screen porches. Porches and decks that are enclosed with insect screening shall be provided with *guards* where the walking surface is located more than 30 inches (762 mm) above the floor or grade below.

1015.6 Mechanical equipment, systems and devices. *Guards* shall be provided where various components that require service are located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The *guard* shall extend not less than 30 inches (762 mm) beyond each end of such components. The *guard* shall be constructed so as to prevent the passage of a sphere 21 inches (533 mm) in diameter.

Exception: *Guards* are not required where permanent fall arrest/restraint anchorage connector devices that comply with ANSI/ASSE Z 359.1 are affixed for use during the entire roof covering lifetime. The devices shall be reevaluated for possible replacement when the entire roof covering is replaced. The devices shall be placed not more than 10 feet (3048 mm) on center along hip and ridge lines and placed not less than 10 feet (3048 mm) from the roof edge or open side of the walking surface.

1015.7 Roof access. *Guards* shall be provided where the roof hatch opening is located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The *guard* shall be constructed so as to prevent the passage of a sphere 21 inches (533 mm) in diameter.

Exception: *Guards* are not required where permanent fall arrest/restraint anchorage connector devices that comply with ANSI/ASSE Z 359.1 are affixed for use during the entire roof covering lifetime. The devices shall be reevaluated for possible replacement when the entire roof covering is replaced. The devices shall be placed not more than 10 feet (3048 mm) on center along hip and ridge lines and placed not less than 10 feet (3048 mm) from the roof edge or open side of the walking surface.

1015.8 Window openings. Windows in Group R-2 and R-3 buildings including *dwelling units*, where the top of the sill of an operable window opening is located less than 36 inches

above the finished floor and more than 72 inches (1829 mm) above the finished grade or other surface below on the exterior of the building, shall comply with one of the following:

1. Operable windows where the top of the sill of the opening is located more than 75 feet (22 860 mm) above the finished grade or other surface below and that are provided with window fall prevention devices that comply with ASTM F2006.
2. Operable windows where the openings will not allow a 4-inch-diameter (102 mm) sphere to pass through the opening when the window is in its largest opened position.
3. Operable windows where the openings are provided with window fall prevention devices that comply with ASTM F2090.
4. Operable windows that are provided with window opening control devices that comply with Section 1015.8.1.

1015.8.1 Window opening control devices. Window opening control devices shall comply with ASTM F2090. The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the minimum net clear opening area of the window unit to less than the area required by Section 1030.2.

SECTION 1016 EXIT ACCESS

1016.1 General. The *exit access* shall comply with the applicable provisions of Sections 1003 through 1015. *Exit access* arrangement shall comply with Sections 1016 through 1021.

1016.2 Egress through intervening spaces. Egress through intervening spaces shall comply with this section.

1. *Exit access* through an enclosed elevator lobby is permitted. Access to not less than one of the required *exits* shall be provided without travel through the enclosed elevator lobbies required by Section 3006. Where the path of exit access travel passes through an enclosed elevator lobby, the level of protection required for the enclosed elevator lobby is not required to be extended to the *exit* unless direct access to an *exit* is required by other sections of this code.
2. Egress from a room or space shall not pass through adjoining or intervening rooms or areas, except where such adjoining rooms or areas and the area served are accessory to one or the other, are not a Group H occupancy and provide a discernible path of egress travel to an *exit*.

Exception: *Means of egress* are not prohibited through adjoining or intervening rooms or spaces in a Group H, S or F occupancy where the adjoining or intervening rooms or spaces are the same or a lesser hazard occupancy group.

3. An *exit access* shall not pass through a room that can be locked to prevent egress.
4. *Means of egress* from *dwelling units* or sleeping areas shall not lead through other sleeping areas, toilet rooms or bathrooms.
5. Egress shall not pass through kitchens, storage rooms, closets or spaces used for similar purposes.

Exceptions:

1. *Means of egress* are not prohibited through a kitchen area serving adjoining rooms constituting part of the same *dwelling unit* or *sleeping unit*.
2. *Means of egress* are not prohibited through stockrooms in Group M occupancies where all of the following are met:
 - 2.1. The stock is of the same hazard classification as that found in the main retail area.
 - 2.2. Not more than 50 percent of the *exit access* is through the stockroom.
 - 2.3. The stockroom is not subject to locking from the egress side.
 - 2.4. There is a demarcated, minimum 44-inch-wide (1118 mm) *aisle* defined by full- or partial-height fixed walls or similar construction that will maintain the required width and lead directly from the retail area to the *exit* without obstructions.

1016.2.1 Multiple tenants. Where more than one tenant occupies any one floor of a building or structure, each tenant space, *dwelling unit* and *sleeping unit* shall be provided with access to the required *exits* without passing through adjacent tenant spaces, *dwelling units* and *sleeping units*.

Exception: The *means of egress* from a smaller tenant space shall not be prohibited from passing through a larger adjoining tenant space where such rooms or spaces of the smaller tenant occupy less than 10 percent of the area of the larger tenant space through which they pass; are the same or similar occupancy group; a discernible path of egress travel to an *exit* is provided; and the *means of egress* into the adjoining space is not subject to locking from the egress side. A required *means of egress* serving the larger tenant space shall not pass through the smaller tenant space or spaces.

SECTION 1017 EXIT ACCESS TRAVEL DISTANCE

1017.1 General. Travel distance within the *exit access* portion of the *means of egress* system shall be in accordance with this section.

1017.2 Limitations. *Exit access* travel distance shall not exceed the values given in Table 1017.2.

**TABLE 1017.2
EXIT ACCESS TRAVEL DISTANCE^a**

| OCCUPANCY | WITHOUT SPRINKLER SYSTEM (feet) | WITH SPRINKLER SYSTEM (feet) |
|----------------------|---------------------------------|------------------------------|
| A, E, F-1, M, R, S-1 | 200 | 250 ^b |
| I-1 | Not Permitted | 250 ^b |
| B | 200 | 300 ^c |
| F-2, S-2, U | 300 | 400 ^c |
| H-1 | Not Permitted | 75 ^d |
| H-2 | Not Permitted | 100 ^d |
| H-3 | Not Permitted | 150 ^d |
| H-4 | Not Permitted | 175 ^d |
| H-5 | Not Permitted | 200 ^c |
| I-2, I-3, I-4 | Not Permitted | 200 ^c |

For SI: 1 foot = 304.8 mm.

- a. See the following sections for modifications to *exit access* travel distance requirements:
- Section 402.8: For the distance limitation in malls.
 - Section 404.9: For the distance limitation through an atrium space.
 - Section 407.4: For the distance limitation in Group I-2.
 - Sections 408.6.1 and 408.8.1: For the distance limitations in Group I-3.
 - Section 411.4: For the distance limitation in special amusement buildings.
 - Section 412.7: For the distance limitations in aircraft manufacturing facilities.
 - Section 1006.2.2.2: For the distance limitation in refrigeration machinery rooms.
 - Section 1006.2.2.3: For the distance limitation in refrigerated rooms and spaces.
 - Section 1006.3.2: For buildings with one exit.
 - Section 1017.2.2: For increased distance limitation in Groups F-1 and S-1.
 - Section 1029.7: For increased limitation in assembly seating.
 - Section 3103.4: For temporary structures.
 - Section 3104.9: For pedestrian walkways.
- b. Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2. See Section 903 for occupancies where *automatic sprinkler systems* are permitted in accordance with Section 903.3.1.2.
- c. Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
- d. Group H occupancies equipped throughout with an *automatic sprinkler system* in accordance with Section 903.2.5.1.

1017.2.1 Exterior egress balcony increase. *Exit access* travel distances specified in Table 1017.2 shall be increased up to an additional 100 feet (30 480 mm) provided the last portion of the *exit access* leading to the *exit* occurs on an exterior egress balcony constructed in accordance with Section 1021. The length of such balcony shall be not less than the amount of the increase taken.

1017.2.2 Group F-1 and S-1 increase. The maximum *exit access* travel distance shall be 400 feet (122 m) in Group F-1 or S-1 occupancies where all of the following conditions are met:

1. The portion of the building classified as Group F-1 or S-1 is limited to one story in height.

2. The minimum height from the finished floor to the bottom of the ceiling or roof slab or deck is 24 feet (7315 mm).
3. The building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

1017.3 Measurement. *Exit access* travel distance shall be measured from the most remote point within a story along the natural and unobstructed path of horizontal and vertical egress travel to the entrance to an *exit*.

Exception: In *open parking garages*, *exit access* travel distance is permitted to be measured to the closest riser of an *exit access stairway* or the closest slope of an *exit access ramp*.

1017.3.1 Exit access stairways and ramps. Travel distance on *exit access stairways* or *ramps* shall be included in the *exit access* travel distance measurement. The measurement along *stairways* shall be made on a plane parallel and tangent to the *stair tread nosings* in the center of the *stair* and landings. The measurement along *ramps* shall be made on the walking surface in the center of the *ramp* and landings.

SECTION 1018 AISLES

1018.1 General. *Aisles* and *aisle accessways* serving as a portion of the *exit access* in the *means of egress* system shall comply with the requirements of this section. *Aisles* or *aisle accessways* shall be provided from all occupied portions of the *exit access* that contain seats, tables, furnishings, displays and similar fixtures or equipment. The minimum width or required capacity of *aisles* shall be unobstructed.

Exception: Encroachments complying with Section 1005.7.

1018.2 Aisles in assembly spaces. *Aisles* and *aisle accessways* serving a room or space used for assembly purposes shall comply with Section 1029.

1018.3 Aisles in Groups B and M. In Group B and M occupancies, the minimum clear aisle width shall be determined by Section 1005.1 for the *occupant load* served, but shall be not less than that required for corridors by Section 1020.2.

Exception: Nonpublic *aisles* serving less than 50 people and not required to be *accessible* by Chapter 11 need not exceed 28 inches (711 mm) in width.

1018.4 Aisle accessways in Group M. An *aisle accessway* shall be provided on not less than one side of each element within the *merchandise pad*. The minimum clear width for an *aisle accessway* not required to be *accessible* shall be 30 inches (762 mm). The required clear width of the *aisle accessway* shall be measured perpendicular to the elements and merchandise within the *merchandise pad*. The 30-inch (762 mm) minimum clear width shall be maintained to pro-

vide a path to an adjacent *aisle* or *aisle accessway*. The *common path of egress travel* shall not exceed 30 feet (9144 mm) from any point in the *merchandise pad*.

Exception: For areas serving not more than 50 occupants, the *common path of egress travel* shall not exceed 75 feet (22 860 mm).

1018.5 Aisles in other than assembly spaces and Groups B and M. In other than rooms or spaces used for assembly purposes and Group B and M occupancies, the minimum clear *aisle* capacity shall be determined by Section 1005.1 for the occupant load served, but the width shall be not less than that required for corridors by Section 1020.2.

Exception: Nonpublic *aisles* serving less than 50 people and not required to be *accessible* by Chapter 11 need not exceed 28 inches (711 mm) in width.

SECTION 1019 EXIT ACCESS STAIRWAYS AND RAMPS

1019.1 General. *Exit access stairways* and *ramps* serving as an *exit access* component in a *means of egress* system shall comply with the requirements of this section. The number of stories connected by *exit access stairways* and *ramps* shall include *basements*, but not *mezzanines*.

1019.2 All occupancies. *Exit access stairways* and *ramps* that serve floor levels within a single story are not required to be enclosed.

1019.3 Occupancies other than Groups I-2 and I-3. In other than Group I-2 and I-3 occupancies, floor openings containing *exit access stairways* or *ramps* that do not comply with one of the conditions listed in this section shall be enclosed with a shaft enclosure constructed in accordance with Section 713.

1. *Exit access stairways* and *ramps* that serve or atmospherically communicate between only two stories. Such interconnected stories shall not be open to other stories.
2. In Group R-1, R-2 or R-3 occupancies, *exit access stairways* and *ramps* connecting four stories or less serving and contained within an individual *dwelling unit* or *sleeping unit* or *live/work unit*.
3. *Exit access stairways* serving and contained within a Group R-3 congregate residence or a Group R-4 facility are not required to be enclosed.
4. *Exit access stairways* and *ramps* in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, where the area of the vertical opening between stories does not exceed twice the horizontal projected area of the *stairway* or *ramp* and the opening is protected by a draft curtain and closely spaced sprinklers in accordance with NFPA 13. In other than Group B and M occupancies, this provi-

sion is limited to openings that do not connect more than four stories.

5. *Exit access stairways and ramps* within an *atrium* complying with the provisions of Section 404.
6. *Exit access stairways and ramps* in *open parking garages* that serve only the parking garage.
7. *Exit access stairways and ramps* serving open-air seating complying with the *exit access* travel distance requirements of Section 1029.7.
8. *Exit access stairways and ramps* serving the balcony, gallery or press box and the main assembly floor in occupancies such as theaters, *places of religious worship*, auditoriums and sports facilities.

1019.4 Group I-2 and I-3 occupancies. In Group I-2 and I-3 occupancies, floor openings between stories containing *exit access stairways* or *ramps* are required to be enclosed with a shaft enclosure constructed in accordance with Section 713.

Exception: In Group I-3 occupancies, *exit access stairways* or *ramps* constructed in accordance with Section 408 are not required to be enclosed.

SECTION 1020 CORRIDORS

1020.1 Construction. *Corridors* shall be fire-resistance rated in accordance with Table 1020.1. The *corridor* walls required to be fire-resistance rated shall comply with Section 708 for *fire partitions*.

Exceptions:

1. A *fire-resistance rating* is not required for *corridors* in an occupancy in Group E where each room that is used for instruction has not less than one door opening directly to the exterior and rooms for assembly purposes have not less than one-half of the required *means of egress* doors opening directly to the exterior. Exterior doors specified in this exception are required to be at ground level.
2. A *fire-resistance rating* is not required for *corridors* contained within a *dwelling unit* or *sleeping unit* in an occupancy in Groups I-1 and R.
3. A *fire-resistance rating* is not required for *corridors* in *open parking garages*.
4. A *fire-resistance rating* is not required for *corridors* in an occupancy in Group B that is a space requiring only a single *means of egress* complying with Section 1006.2.
5. *Corridors* adjacent to the *exterior walls* of buildings shall be permitted to have unprotected openings on unrated *exterior walls* where unrated walls are permitted by Table 602 and unprotected openings are permitted by Table 705.8.

**TABLE 1020.1
CORRIDOR FIRE-RESISTANCE RATING**

| OCCUPANCY | OCCUPANT LOAD SERVED BY CORRIDOR | REQUIRED FIRE-RESISTANCE RATING (hours) | |
|------------------------|----------------------------------|---|------------------------------------|
| | | Without sprinkler system | With sprinkler system ^c |
| H-1, H-2, H-3 | All | Not Permitted | 1 |
| H-4, H-5 | Greater than 30 | Not Permitted | 1 |
| A, B, E, F, M, S, U | Greater than 30 | 1 | 0 |
| R | Greater than 10 | Not Permitted | 0.5 |
| I-2 ^a , I-4 | All | Not Permitted | 0 |
| I-1, I-3 | All | Not Permitted | 1 ^b |

a. For requirements for occupancies in Group I-2, see Sections 407.2 and 407.3.

b. For a reduction in the *fire-resistance rating* for occupancies in Group I-3, see Section 408.8.

c. Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2 where allowed.

1020.2 Width and capacity. The required capacity of *corridors* shall be determined as specified in Section 1005.1, but the minimum width shall be not less than that specified in Table 1020.2.

Exception: In Group I-2 occupancies, *corridors* are not required to have a clear width of 96 inches (2438 mm) in areas where there will not be stretcher or bed movement for access to care or as part of the defend-in-place strategy.

**TABLE 1020.2
MINIMUM CORRIDOR WIDTH**

| OCCUPANCY | MINIMUM WIDTH (inches) |
|--|------------------------|
| Any facilities not listed below | 44 |
| Access to and utilization of mechanical, plumbing or electrical systems or equipment | 24 |
| With an occupant load of less than 50 | 36 |
| Within a <i>dwelling unit</i> | 36 |
| In Group E with a <i>corridor</i> having an occupant load of 100 or more | 72 |
| In <i>corridors</i> and areas serving stretcher traffic in occupancies where patients receive outpatient medical care that causes the patient to be incapable of self-preservation | 72 |
| Group I-2 in areas where required for bed movement | 96 |

For SI: 1 inch = 25.4 mm.

1020.3 Obstruction. The minimum width or required capacity of *corridors* shall be unobstructed.

Exception: Encroachments complying with Section 1005.7.

1020.4 Dead ends. Where more than one *exit* or *exit access doorway* is required, the *exit access* shall be arranged such that there are no dead ends in *corridors* more than 20 feet (6096 mm) in length.

Exceptions:

1. In occupancies in Group I-3 of Condition 2, 3 or 4, the dead end in a *corridor* shall not exceed 50 feet (15 240 mm).
2. In occupancies in Groups B, E, F, I-1, M, R-1, R-2, R-4, S and U, where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, the length of the dead-end *corridors* shall not exceed 50 feet (15 240 mm).
3. A dead-end *corridor* shall not be limited in length where the length of the dead-end *corridor* is less than 2.5 times the least width of the dead-end *corridor*.

1020.5 Air movement in corridors. *Corridors* shall not serve as supply, return, exhaust, relief or ventilation air ducts.

Exceptions:

1. Use of a *corridor* as a source of makeup air for exhaust systems in rooms that open directly onto such *corridors*, including toilet rooms, bathrooms, dressing rooms, smoking lounges and janitor closets, shall be permitted, provided that each such *corridor* is directly supplied with outdoor air at a rate greater than the rate of makeup air taken from the *corridor*.
2. Where located within a *dwelling unit*, the use of *corridors* for conveying return air shall not be prohibited.
3. Where located within tenant spaces of 1,000 square feet (93 m²) or less in area, utilization of *corridors* for conveying return air is permitted.
4. Incidental air movement from pressurized rooms within health care facilities, provided that the *corridor* is not the primary source of supply or return to the room.

1020.5.1 Corridor ceiling. Use of the space between the *corridor* ceiling and the floor or roof structure above as a return air plenum is permitted for one or more of the following conditions:

1. The *corridor* is not required to be of *fire-resistance-rated* construction.
2. The *corridor* is separated from the plenum by *fire-resistance-rated* construction.
3. The air-handling system serving the *corridor* is shut down upon activation of the air-handling unit *smoke detectors* required by the *Mechanical Code*.
4. The air-handling system serving the *corridor* is shut down upon detection of sprinkler water flow where

the building is equipped throughout with an *automatic sprinkler system*.

5. The space between the *corridor* ceiling and the floor or roof structure above the *corridor* is used as a component of an approved engineered smoke control system.

1020.6 Corridor continuity. *Fire-resistance-rated corridors* shall be continuous from the point of entry to an *exit*, and shall not be interrupted by intervening rooms. Where the path of egress travel within a *fire-resistance-rated corridor* to the exit includes travel along unenclosed *exit access stairways* or *ramps*, the *fire-resistance rating* shall be continuous for the length of the *stairway* or *ramp* and for the length of the connecting *corridor* on the adjacent floor leading to the *exit*.

Exceptions:

1. Foyers, lobbies or reception rooms constructed as required for *corridors* shall not be construed as intervening rooms.
2. Enclosed elevator lobbies as permitted by Item 1 of Section 1016.2 shall not be construed as intervening rooms.

SECTION 1021 EGRESS BALCONIES

1021.1 General. Balconies used for egress purposes shall conform to the same requirements as *corridors* for minimum width, required capacity, headroom, dead ends and projections.

1021.2 Wall separation. Exterior egress balconies shall be separated from the interior of the building by walls and opening protectives as required for *corridors*.

Exception: Separation is not required where the exterior egress balcony is served by not less than two *stairways* and a dead-end travel condition does not require travel past an unprotected opening to reach a *stairway*.

1021.3 Openness. The long side of an egress balcony shall be at least 50 percent open, and the open area above the *guards* shall be so distributed as to minimize the accumulation of smoke or toxic gases.

1021.4 Location. Exterior egress balconies shall have a minimum *fire separation distance* of 10 feet (3048 mm) measured at right angles from the exterior edge of the egress balcony to the following:

1. Adjacent *lot lines*.
2. Other portions of the building.
3. Other buildings on the same lot unless the adjacent building *exterior walls* and openings are protected in accordance with Section 705 based on *fire separation distance*.

For the purposes of this section, other portions of the building shall be treated as separate buildings.

SECTION 1022 EXITS

1022.1 General. *Exits* shall comply with Sections 1022 through 1027 and the applicable requirements of Sections 1003 through 1015. An *exit* shall not be used for any purpose that interferes with its function as a *means of egress*. Once a given level of *exit* protection is achieved, such level of protection shall not be reduced until arrival at the *exit discharge*. *Exits* shall be continuous from the point of entry into the *exit* to the *exit discharge*.

1022.2 Exterior exit doors. Buildings or structures used for human occupancy shall have not less than one exterior door that meets the requirements of Section 1010.1.1.

1022.2.1 Detailed requirements. Exterior *exit* doors shall comply with the applicable requirements of Section 1010.1.

1022.2.2 Arrangement. Exterior *exit* doors shall lead directly to the *exit discharge* or the *public way*.

SECTION 1023 INTERIOR EXIT STAIRWAYS AND RAMPS

1023.1 General. *Interior exit stairways* and *ramps* serving as an *exit* component in a *means of egress* system shall comply with the requirements of this section. *Interior exit stairways* and *ramps* shall be enclosed and lead directly to the exterior of the building or shall be extended to the exterior of the building with an *exit passageway* conforming to the requirements of Section 1024, except as permitted in Section 1028.1. An *interior exit stairway* or *ramp* shall not be used for any purpose other than as a *means of egress* and a circulation path.

1023.2 Construction. Enclosures for *interior exit stairways* and *ramps* shall be constructed as *fire barriers* in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. *Interior exit stairway* and *ramp* enclosures shall have a *fire-resistance rating* of not less than 2 hours where connecting four stories or more and not less than 1 hour where connecting less than four stories. The number of stories connected by the *interior exit stairways* or *ramps* shall include any *basements*, but not any *mezzanines*. *Interior exit stairways* and *ramps* shall have a *fire-resistance rating* not less than the floor assembly penetrated, but need not exceed 2 hours.

Exceptions:

1. *Interior exit stairways* and *ramps* in Group I-3 occupancies in accordance with the provisions of Section 408.3.8.
2. *Interior exit stairways* within an *atrium* enclosed in accordance with Section 404.6.

1023.3 Termination. *Interior exit stairways* and *ramps* shall terminate at an *exit discharge* or a *public way*.

Exception: A combination of *interior exit stairways*, *interior exit ramps* and *exit passageways*, constructed in

accordance with Sections 1023.2, 1023.3.1 and 1024, respectively, and forming a continuous protected enclosure, shall be permitted to extend an *interior exit stairway* or *ramp* to the *exit discharge* or a *public way*.

1023.3.1 Extension. Where interior exit stairways and ramps are extended to an exit discharge or a public way by an exit passageway, the interior exit stairway and ramp shall be separated from the exit passageway by a fire barrier constructed in accordance with Section 707 or a horizontal assembly constructed in accordance with Section 711, or both. The fire-resistance rating shall be not less than that required for the interior exit stairway and ramp. A fire door assembly complying with Section 716.5 shall be installed in the fire barrier to provide a means of egress from the interior exit stairway and ramp to the exit passageway. Openings in the fire barrier other than the fire door assembly are prohibited. Penetrations of the fire barrier are prohibited.

Exceptions:

1. Penetrations of the fire barrier in accordance with Section 1023.5 shall be permitted.
2. Separation between an interior exit stairway or ramp and the exit passageway extension shall not be required where there are no openings into the exit passageway extension.
3. Separation between an interior exit stairway or ramp and the exit passageway extension shall not be required when the interior exit stair and the exit passageway extension are pressurized in accordance with Section 909.20.5.

1023.4 Openings. *Interior exit stairway* and *ramp* opening protectives shall be in accordance with the requirements of Section 716.

Openings in *interior exit stairways* and *ramps* other than unprotected exterior openings shall be limited to those necessary for *exit access* to the enclosure from normally occupied spaces and for egress from the enclosure.

Elevators shall not open into *interior exit stairways* and *ramps*.

1023.5 Penetrations. Penetrations into or through *interior exit stairways* and *ramps* are prohibited except for equipment and ductwork necessary for independent ventilation or pressurization, sprinkler piping, standpipes, electrical raceway for fire department communication systems and electrical raceway serving the *interior exit stairway* and *ramp* and terminating at a steel box not exceeding 16 square inches (0.010 m²). Such penetrations shall be protected in accordance with Section 714. There shall not be penetrations or communication openings, whether protected or not, between adjacent *interior exit stairways* and *ramps*.

Exception: Membrane penetrations shall be permitted on the outside of the *interior exit stairway* and *ramp*. Such penetrations shall be protected in accordance with Section 714.3.2.

1023.6 Ventilation. Equipment and ductwork for *interior exit stairway* and *ramp* ventilation as permitted by Section 1023.5 shall comply with one of the following items:

1. Such equipment and ductwork shall be located exterior to the building and shall be directly connected to the *interior exit stairway* and *ramp* by ductwork enclosed in construction as required for shafts.
2. Where such equipment and ductwork is located within the *interior exit stairway* and *ramp*, the intake air shall be taken directly from the outdoors and the exhaust air shall be discharged directly to the outdoors, or such air shall be conveyed through ducts enclosed in construction as required for shafts.
3. Where located within the building, such equipment and ductwork shall be separated from the remainder of the building, including other mechanical equipment, with construction as required for shafts.

In each case, openings into the *fire-resistance-rated* construction shall be limited to those needed for maintenance and operation and shall be protected by opening protectives in accordance with Section 716 for shaft enclosures.

The *interior exit stairway* and *ramp* ventilation systems shall be independent of other building ventilation systems.

1023.7 Interior exit stairway and ramp exterior walls. *Exterior walls* of the *interior exit stairway* or *ramp* shall comply with the requirements of Section 705 for *exterior walls*. Where nonrated walls or unprotected openings enclose the exterior of the *stairway* or *ramps* and the walls or openings are exposed by other parts of the building at an angle of less than 180 degrees (3.14 rad), the building *exterior walls* within 10 feet (3048 mm) horizontally of a nonrated wall or unprotected opening shall have a *fire-resistance rating* of not less than 1 hour. Openings within such *exterior walls* shall be protected by opening protectives having a *fire protection rating* of not less than $\frac{3}{4}$ hour. This construction shall extend vertically from the ground to a point 10 feet (3048 mm) above the topmost landing of the *stairway* or *ramp*, or to the roof line, whichever is lower.

1023.8 Discharge identification. An *interior exit stairway* and *ramp* shall not continue below its *level of exit discharge* unless an *approved barrier* is provided at the *level of exit discharge* to prevent persons from unintentionally continuing into levels below. Directional exit signs shall be provided as specified in Section 1013.

1023.9 Stairway signage. Signs shall be provided for all *interior exit stairways* and *ramps* connecting more than three stories, and for all *interior exit stairways* and *ramps* in buildings with three or more *interior exit stairways* or *ramps*.

1023.9.1 Signs outside stairway. A sign shall be provided at each entrance to the *exit stairway* and *ramp*, identifying the stair or ramp with the same designations used for the stairway identification signs in Section 1023.9.2.1. The sign also shall state "EXIT" in accordance with Section 1013.4. The sign shall state the required text in visual characters, in raised characters, and in braille complying with ICC A117.1.

1023.9.2 Signs inside stairway. *Stairway* identification signs, floor-level signs, and *exit discharge* signs shall comply with the following requirements:

1023.9.2.1 Stairway identification signs. A *stairway* identification sign shall be provided at each floor landing in the *interior exit stairway* and *ramp* designating the floor level, the terminus of the top and bottom of the *interior exit stairway* or *ramp* and the identification of the *stair* or *ramp*. The signage shall also identify the story of, and the direction to, the *exit discharge* and the availability of roof access from the *interior exit stairway* and *ramp* for the fire department. The sign shall be located entirely between 5 feet (1524 mm) and 8 feet (2438 mm) above the floor landing in a position that is readily visible when the doors are in the open and closed positions and located so that occupants egressing from floors that are more remote from the exit discharge will face the sign frontally at some point in their path of egress.

Exception: *Stairway* identification signs are not required to identify the *story of*, and direction to the *exit discharge* in *interior exit stairways* and *ramps* that connect less than three stories.

1023.9.2.1.1 Signage requirements. *Stairway* identification signs shall comply with all of the following requirements:

1. The signs shall be a minimum size of 18 inches (457 mm) by 12 inches (305 mm).
2. The word "STAIR" and the *stair* designation or "RAMP" and the *ramp* designation shall consist of numerals and/or capital letters designating the identification of the *interior exit stairway* and *ramp*. The characters shall be a minimum of $1\frac{1}{2}$ inches (38 mm) in height but not greater than one-third the height of the floor level identification characters.
3. The numerals or capital letters designating the floor level shall be a minimum of 5 inches (127 mm) in height and located in the center of the sign.
4. All other lettering and numbers shall be a minimum of 1 inch (25 mm) in height but not greater than the *stair* or *ramp* identification characters.
5. The directional arrow shall be a minimum of 4 inches (102 mm) in length.
6. If the *interior exit stairway* or *ramp* provides access to the roof, the words "FIRE DEPT. ROOF ACCESS" shall be displayed immediately after the *stair* or *ramp* identification.
7. The signs shall identify floor levels, *stairs* and *ramps* by one or more characters, using a designation that is consistent with the floor level, *stair* and *ramp* designations used throughout the building.

8. Characters and their background shall have a nonglare finish. Characters shall contrast with their background, with either light characters on a dark background or dark characters on a light background.
9. The sign shall be of an approved design, and shall be durable and of a material that complies with other sections of the *Construction Codes*. Unless painted on the wall, the sign shall be securely fastened to the structure.

1023.9.2.2 Floor-level signs. In addition to the *stairway* identification sign, a floor-level sign in visual characters, raised characters and braille complying with ICC A117.1 shall be located at each floor-level landing adjacent to the door leading from the *interior exit stairway* and *ramp* into the *corridor* or other building space to identify the floor level.

1023.9.2.3 Exit discharge signs. A sign stating "EXIT" in visual characters, raised characters and braille shall be located adjacent to the door to the *exit discharge* in accordance with Section 1013.4.

1023.10 Elevator lobby identification signs. At landings in *interior exit stairways* where two or more doors lead to the floor level, any door with direct access to an enclosed elevator lobby shall be identified by signage located on the door or directly adjacent to the door stating "Elevator Lobby." Signage shall be in accordance with Section 1023.9.1, Items 4, 5 and 6.

1023.11 Smokeproof enclosures. Where required by Section 403.5.4 or 405.7.2, *interior exit stairways* and *ramps* shall be *smokeproof enclosures* in accordance with Section 909.20.

1023.11.1 Termination and extension. A *smokeproof enclosure* shall terminate at an *exit discharge* or a *public way*. The *smokeproof enclosure* shall be permitted to be extended by an *exit passageway* in accordance with Section 1023.3. The *exit passageway* shall be without openings other than the *fire door assembly* required by Section 1023.3.1 and those necessary for egress from the *exit passageway*. The *exit passageway* shall be separated from the remainder of the building by 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

Exceptions:

1. Openings in the *exit passageway* serving a *smokeproof enclosure* are permitted where the *exit passageway* is protected and pressurized in the same manner as the *smokeproof enclosure*, and openings are protected as required for access from other floors.
2. The *fire barrier* separating the *smokeproof enclosure* from the *exit passageway* is not required, provided the *exit passageway* is protected and pressurized in the same manner as the *smokeproof enclosure*.

3. A *smokeproof enclosure* shall be permitted to egress through areas on the *level of exit discharge* or vestibules as permitted by Section 1028.

1023.11.2 Enclosure access. Access to the *stairway* or *ramp* within a *smokeproof enclosure* shall be by way of a vestibule or an open exterior balcony.

Exception: Access is not required by way of a vestibule or exterior balcony for *stairways* and *ramps* using the pressurization alternative complying with Section 909.20.5.

**SECTION 1024
[Reserved]**

**SECTION 1025
[Reserved]**

**SECTION 1026
HORIZONTAL EXITS**

1026.1 Horizontal exits. *Horizontal exits* serving as an *exit* in a *means of egress* system shall comply with the requirements of this section. A *horizontal exit* shall not serve as the only *exit* from a portion of a building, and where two or more *exits* are required, not more than one-half of the total number of *exits* or total *exit* minimum width or required capacity shall be *horizontal exits*.

Exceptions:

1. *Horizontal exits* are permitted to comprise two-thirds of the required *exits* from any building or floor area for occupancies in Group I-2.
2. *Horizontal exits* are permitted to comprise 100 percent of the *exits* required for occupancies in Group I-3. Not less than 6 square feet (0.6 m²) of accessible space per occupant shall be provided on each side of the *horizontal exit* for the total number of people in adjoining compartments.

1026.2 Separation. The separation between buildings or refuge areas connected by a *horizontal exit* shall be provided by a *fire wall* complying with Section 706; or by a *fire barrier* complying with Section 707 or a *horizontal assembly* complying with Section 711, or both. The minimum *fire-resistance rating* of the separation shall be 2 hours. Opening protectives in *horizontal exits* shall also comply with Section 716. Duct and air transfer openings in a *fire wall* or *fire barrier* that serves as a *horizontal exit* shall also comply with Section 717. The *horizontal exit* separation shall extend vertically through all levels of the building unless floor assemblies have a *fire-resistance rating* of not less than 2 hours with no unprotected openings.

Exception: A *fire-resistance rating* is not required at *horizontal exits* between a building area and an above-grade *pedestrian walkway* constructed in accordance with Section 3104, provided that the distance between connected buildings is more than 20 feet (6096 mm).

Horizontal exits constructed as *fire barriers* shall be continuous from *exterior wall* to *exterior wall* so as to divide completely the floor served by the *horizontal exit*.

1026.3 Opening protectives. *Fire doors* in *horizontal exits* shall be self-closing or automatic-closing when activated by a *smoke detector* in accordance with Section 716.5.9.3. Doors, where located in a cross-corridor condition, shall be automatic-closing by activation of a *smoke detector* installed in accordance with Section 716.5.9.3.

1026.4 Refuge area. The refuge area of a *horizontal exit* shall be a space occupied by the same tenant or a public area and each such refuge area shall be adequate to accommodate the original *occupant load* of the refuge area plus the *occupant load* anticipated from the adjoining compartment. The anticipated *occupant load* from the adjoining compartment shall be based on the capacity of the *horizontal exit doors* entering the refuge area.

1026.4.1 Capacity. The capacity of the refuge area shall be computed based on a *net floor area* allowance of 3 square feet (0.2787 m²) for each occupant to be accommodated therein.

Exceptions: The *net floor area* allowable per occupant shall be as follows for the indicated occupancies:

1. Six square feet (0.6 m²) per occupant for occupancies in Group I-3.
2. Fifteen square feet (1.4 m²) per occupant for ambulatory occupancies in Group I-2.
3. Thirty square feet (2.8 m²) per occupant for nonambulatory occupancies in Group I-2.

1026.4.2 Number of exits. The refuge area into which a *horizontal exit* leads shall be provided with *exits* adequate to meet the occupant requirements of this chapter, but not including the added *occupant load* imposed by persons entering the refuge area through *horizontal exits* from other areas. Not less than one refuge area exit shall lead directly to the exterior or to an *interior exit stairway* or *ramp*.

Exception: The adjoining compartment shall not be required to have a *stairway* or door leading directly outside, provided the refuge area into which a *horizontal exit* leads has *stairways* or doors leading directly outside and are so arranged that egress shall not require the occupants to return through the compartment from which egress originates.

SECTION 1027 EXTERIOR EXIT STAIRWAYS AND RAMPS

1027.1 Exterior exit stairways and ramps. *Exterior exit stairways* and *ramps* serving as an element of a required *means of egress* shall comply with this section.

1027.2 Use in a means of egress. *Exterior exit stairways* shall not be used as an element of a required *means of egress* for Group I-2 occupancies. For occupancies in other than

Group I-2, *exterior exit stairways* and *ramps* shall be permitted as an element of a required *means of egress* for buildings not exceeding six stories above *grade plane* or that are not *high-rise buildings*.

1027.3 Open side. *Exterior exit stairways* and *ramps* serving as an element of a required *means of egress* shall be open on not less than one side, except for required structural columns, beams, *handrails* and *guards*. An open side shall have not less than 35 square feet (3.3 m²) of aggregate open area adjacent to each floor level and the level of each intermediate landing. The required open area shall be located not less than 42 inches (1067 mm) above the adjacent floor or landing level.

1027.4 Side yards. The open areas adjoining *exterior exit stairways* or *ramps* shall be either *yards*, *courts* or *public ways*; the remaining sides are permitted to be enclosed by the *exterior walls* of the building.

1027.5 Location. *Exterior exit stairways* and *ramps* shall have a minimum fire separation distance of 10 feet (3048 mm) measured at right angles from the exterior edge of the *stairway* or *ramps*, including landings, to:

1. Adjacent *lot lines*.
2. Other portions of the building.
3. Other buildings on the same lot unless the adjacent building *exterior walls* and openings are protected in accordance with Section 705 based on *fire separation distance*.

For the purposes of this section, other portions of the building shall be treated as separate buildings.

1027.6 Exterior exit stairway and ramp protection. *Exterior exit stairways* and *ramps* shall be separated from the interior of the building as required in Section 1023.2. Openings shall be limited to those necessary for egress from normally occupied spaces. Where a vertical plane projecting from the edge of an *exterior exit stairway* or *ramp* and landings is exposed by other parts of the building at an angle of less than 180 degrees (3.14 rad), the exterior wall shall be rated in accordance with Section 1023.7.

Exceptions:

1. Separation from the interior of the building is not required for occupancies, other than those in Group R-1 or R-2, in buildings that are not more than two stories above *grade plane* where a *level of exit discharge* serving such occupancies is the first story above *grade plane*.
2. Separation from the interior of the building is not required where the *exterior exit stairway* or *ramp* is served by an *exterior exit ramp* or balcony that connects two remote *exterior exit stairways* or other *approved exits* with a perimeter that is not less than 50 percent open. To be considered open, the opening shall be not less than 50 percent of the height of the enclosing wall, with the top of the openings not less than 7 feet (2134 mm) above the top of the balcony.

3. Separation from the open-ended *corridor* of the building is not required for *exterior exit stairways* or *ramps*, provided that Items 3.1 through 3.5 are met:

- 3.1. The building, including open-ended *corridors*, and *stairways* and *ramps*, shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.
- 3.2. The open-ended *corridors* comply with Section 1020.
- 3.3. The open-ended *corridors* are connected on each end to an *exterior exit stairway* or *ramp* complying with Section 1027.
- 3.4. The *exterior walls* and openings adjacent to the *exterior exit stairway* or *ramp* comply with Section 1023.7.
- 3.5. At any location in an open-ended *corridor* where a change of direction exceeding 45 degrees (0.79 rad) occurs, a clear opening of not less than 35 square feet (3.3 m²) or an *exterior stairway* or *ramp* shall be provided. Where clear openings are provided, they shall be located so as to minimize the accumulation of smoke or toxic gases.

SECTION 1028 EXIT DISCHARGE

1028.1 General. *Exits* shall discharge directly to the exterior of the building. The *exit discharge* shall be at grade or shall provide a direct path of egress travel to grade. The *exit discharge* shall not reenter a building. The combined use of Exceptions 1 and 2 shall not exceed 50 percent of the number and minimum width or required capacity of the required exits.

Exceptions:

1. Not more than 50 percent of the number and minimum width or required capacity of *interior exit stairways* and *ramps* is permitted to egress through areas on the level of discharge provided all of the following conditions are met:
 - 1.1. Discharge of *interior exit stairways* and *ramps* shall be provided with a free and unobstructed path of travel to an exterior *exit* door and such *exit* is readily visible and identifiable from the point of termination of the enclosure.
 - 1.2. The entire area of the *level of exit discharge* is separated from areas below by construction conforming to the *fire-resistance rating* for the enclosure.
 - 1.3. The egress path from the *interior exit stairway* and *ramp* on the *level of exit discharge* is protected throughout by an *approved automatic sprinkler system*. Portions of the

level of exit discharge with access to the egress path shall be either equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2, or separated from the egress path in accordance with the requirements for the enclosure of *interior exit stairways* or *ramps*.

- 1.4. Where a required *interior exit stairway* or *ramp* and an *exit access stairway* or *ramp* serve the same floor level and terminate at the same *level of exit discharge*, the termination of the *exit access stairway* or *ramp* and the *exit discharge* door of the *interior exit stairway* or *ramp* shall be separated by a distance of not less than 30 feet (9144 mm) or not less than one-fourth the length of the maximum overall diagonal dimension of the building, whichever is less. The distance shall be measured in a straight line between the *exit discharge* door from the *interior exit stairway* or *ramp* and the last tread of the *exit access stairway* or termination of slope of the *exit access ramp*.
2. Not more than 50 percent of the number and minimum width or required capacity of the *interior exit stairways* and *ramps* is permitted to egress through a vestibule provided all of the following conditions are met:
 - 2.1. The entire area of the vestibule is separated from areas below by construction conforming to the *fire-resistance rating* of the *interior exit stairway* or *ramp enclosure*.
 - 2.2. The depth from the exterior of the building is not greater than 10 feet (3048 mm) and the length is not greater than 30 feet (9144 mm).
 - 2.3. The area is separated from the remainder of the *level of exit discharge* by a *fire partition* constructed in accordance with Section 708.

Exception: The maximum transmitted temperature rise is not required.
 - 2.4. The area is used only for *means of egress* and *exits* directly to the outside.
3. *Horizontal exits* complying with Section 1026 shall not be required to discharge directly to the exterior of the building.

1028.2 Exit discharge width or capacity. The minimum width or required capacity of the *exit discharge* shall be not less than the minimum width or required capacity of the *exits* being served.

1028.3 Exit discharge components. *Exit discharge* components shall be sufficiently open to the exterior so as to minimize the accumulation of smoke and toxic gases.

1028.4 Egress courts. *Egress courts* serving as a portion of the *exit discharge* in the *means of egress* system shall comply with the requirements of Sections 1028.4.1 and 1028.4.2.

1028.4.1 Width or capacity. The required capacity of *egress courts* shall be determined as specified in Section 1005.1, but the minimum width shall be not less than 44 inches (1118 mm), except as specified herein. *Egress courts* serving Group R-3 and U occupancies shall be not less than 36 inches (914 mm) in width. The required capacity and width of *egress courts* shall be unobstructed to a height of 7 feet (2134 mm).

Exception: Encroachments complying with Section 1005.7.

Where an *egress court* exceeds the minimum required width and the width of such *egress court* is then reduced along the path of exit travel, the reduction in width shall be gradual. The transition in width shall be affected by a guard not less than 36 inches (914 mm) in height and shall not create an angle of more than 30 degrees (0.52 rad) with respect to the axis of the *egress court* along the path of egress travel. The width of the *egress court* shall not be less than the required capacity.

1028.4.2 Construction and openings. Where an *egress court* serving a building or portion thereof is less than 10 feet (3048 mm) in width, the *egress court* walls shall have not less than 1-hour *fire-resistance-rated* construction for a distance of 10 feet (3048 mm) above the floor of the *egress court*. Openings within such walls shall be protected by opening protectives having a fire protection rating of not less than $\frac{3}{4}$ hour.

Exceptions:

1. *Egress courts* serving an *occupant load* of less than 10.
2. *Egress courts* serving Group R-3.

1028.5 Access to a public way. The *exit discharge* shall provide a direct and unobstructed access to a *public way*.

Exception: Where access to a *public way* cannot be provided, a safe dispersal area shall be provided where all of the following are met:

1. The area shall be of a size to accommodate not less than 5 square feet (0.46 m²) for each person.
2. The area shall be located on the same lot not less than 50 feet (15 240 mm) away from the building requiring egress.
3. The area shall be permanently maintained and identified as a safe dispersal area.
4. The area shall be provided with a safe and unobstructed path of travel from the building.

SECTION 1029 ASSEMBLY

1029.1 General. A room or space used for assembly purposes that contains seats, tables, displays, equipment or other material shall comply with this section.

1029.1.1 Bleachers. *Bleachers*, *grandstands* and *folding and telescopic seating*, that are not building elements, shall comply with ICC 300.

1029.1.1.1 Spaces under grandstands and bleachers.

Where spaces under *grandstands* or *bleachers* are used for purposes other than ticket booths less than 100 square feet (9.29 m²) and toilet rooms, such spaces shall be separated by *fire barriers* complying with Section 707 and *horizontal assemblies* complying with Section 711 with not less than 1-hour *fire-resistance-rated* construction.

1029.2 Assembly main exit. A building, room or space used for assembly purposes that has an *occupant load* of greater than 300 and is provided with a main *exit*, that main *exit* shall be of sufficient capacity to accommodate not less than one-half of the *occupant load*, but such capacity shall be not less than the total required capacity of all *means of egress* leading to the *exit*. Where the building is classified as a Group A occupancy, the main *exit* shall front on not less than one street or an unoccupied space of not less than 10 feet (3048 mm) in width that adjoins a street or *public way*. In a building, room or space used for assembly purposes where there is not a well-defined main *exit* or where multiple main *exits* are provided, *exits* shall be permitted to be distributed around the perimeter of the building provided that the total capacity of egress is not less than 100 percent of the required capacity.

1029.3 Assembly other exits. In addition to having access to a main *exit*, each level in a building used for assembly purposes having an *occupant load* greater than 300 and provided with a main *exit*, shall be provided with additional *means of egress* that shall provide an egress capacity for not less than one-half of the total *occupant load* served by that level and shall comply with Section 1007.1. In a building used for assembly purposes where there is not a well-defined main *exit* or where multiple main *exits* are provided, *exits* for each level shall be permitted to be distributed around the perimeter of the building, provided that the total width of egress is not less than 100 percent of the required width.

1029.4 Foyers and lobbies. In Group A-1 occupancies, where persons are admitted to the building at times when seats are not available, such persons shall be allowed to wait in a lobby or similar space, provided such lobby or similar space shall not encroach upon the minimum width or required capacity of the *means of egress*. Such foyer, if not directly connected to a public street by all the main entrances or *exits*, shall have a straight and unobstructed *corridor* or path of travel to every such main entrance or *exit*.

1029.5 Interior balcony and gallery means of egress. For balconies, galleries or press boxes having a seating capacity of 50 or more located in a building, room or space used for assembly purposes, not less than two *means of egress* shall be provided, with one from each side of every balcony, gallery or press box.

1029.6 Capacity of aisle for assembly. The required capacity of *aisles* shall be not less than that determined in accordance with Section 1029.6.1 where *smoke-protected assembly seating* is not provided and with Section 1029.6.2 or 1029.6.3 where *smoke-protected assembly seating* is provided.

1029.6.1 Without smoke protection. The required capacity in inches (mm) of the *aisles* for assembly seating without smoke protection shall be not less than the *occupant load* served by the egress element in accordance with all of the following, as applicable:

1. Not less than 0.3 inch (7.6 mm) of *aisle* capacity for each occupant served shall be provided on stepped *aisles* having riser heights 7 inches (178 mm) or less and tread depths 11 inches (279 mm) or greater, measured horizontally between tread *nosings*.
2. Not less than 0.005 inch (0.127 mm) of additional *aisle* capacity for each occupant shall be provided for each 0.10 inch (2.5 mm) of riser height above 7 inches (178 mm).
3. Where egress requires stepped *aisle* descent, not less than 0.075 inch (1.9 mm) of additional *aisle* capacity for each occupant shall be provided on those portions of *aisle* capacity having no *handrail* within a horizontal distance of 30 inches (762 mm).
4. Ramped *aisles*, where slopes are steeper than one unit vertical in 12 units horizontal (8-percent slope), shall have not less than 0.22 inch (5.6 mm) of clear *aisle* capacity for each occupant served. Level or ramped *aisles*, where slopes are not steeper than one unit vertical in 12 units horizontal (8-percent slope), shall have not less than 0.20 inch (5.1 mm) of clear *aisle* capacity for each occupant served.

1029.6.2 Smoke-protected assembly seating. The required capacity in inches (mm) of the aisle for *smoke-protected assembly seating* shall be not less than the occupant load served by the egress element multiplied by the

appropriate factor in Table 1029.6.2. The total number of seats specified shall be those within the space exposed to the same smoke-protected environment. Interpolation is permitted between the specific values shown. A life safety evaluation, complying with NFPA 101, shall be done for a facility utilizing the reduced width requirements of Table 1029.6.2 for *smoke-protected assembly seating*.

Exception: For outdoor *smoke-protected assembly seating* with an *occupant load* not greater than 18,000, the required capacity in inches (mm) shall be determined using the factors in Section 1029.6.3.

1029.6.2.1 Smoke control. *Aisles* and *aisle accessways* serving a *smoke-protected assembly seating* area shall be provided with a smoke control system complying with Section 909 or natural ventilation designed to maintain the smoke level not less than 6 feet (1829 mm) above the floor of the *means of egress*.

1029.6.2.2 Roof height. A *smoke-protected assembly seating* area with a roof shall have the lowest portion of the roof deck not less than 15 feet (4572 mm) above the highest *aisle* or *aisle accessway*.

Exception: A roof canopy in an outdoor stadium shall be permitted to be less than 15 feet (4572 mm) above the highest *aisle* or *aisle accessway* provided that there are no objects less than 80 inches (2032 mm) above the highest *aisle* or *aisle accessway*.

1029.6.2.3 Automatic sprinklers. Enclosed areas with walls and ceilings in buildings or structures containing *smoke-protected assembly seating* shall be protected with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1.

Exceptions:

1. The floor area used for contests, performances or entertainment provided the roof construction is more than 50 feet (15 240 mm) above the floor level and the use is restricted to low fire hazard uses.
2. Press boxes and storage facilities less than 1,000 square feet (93 m²) in area.
3. Outdoor seating facilities where seating and the *means of egress* in the seating area are essentially open to the outside.

**TABLE 1029.6.2
CAPACITY FOR AISLES FOR SMOKE-PROTECTED ASSEMBLY**

| TOTAL NUMBER OF SEATS IN THE SMOKE-PROTECTED ASSEMBLY SEATING | INCHES OF CAPACITY PER SEAT SERVED | | | |
|---|--|---|---|---|
| | Stepped aisles with handrails within 30 inches | Stepped aisles without handrails within 30 inches | Level aisles or ramped aisles not steeper than 1 in 10 in slope | Ramped aisles steeper than 1 in 10 in slope |
| Equal to or less than 5,000 | 0.200 | 0.250 | 0.150 | 0.165 |
| 10,000 | 0.130 | 0.163 | 0.100 | 0.110 |
| 15,000 | 0.096 | 0.120 | 0.070 | 0.077 |
| 20,000 | 0.076 | 0.095 | 0.056 | 0.062 |
| Equal to or greater than 25,000 | 0.060 | 0.075 | 0.044 | 0.048 |

For SI: 1 inch = 25.4 mm.

1029.6.3 Outdoor smoke-protected assembly seating.

The required capacity in inches (mm) of *aisles* shall be not less than the total *occupant load* served by the egress element multiplied by 0.08 (2.0 mm) where egress is by stepped *aisle* and multiplied by 0.06 (1.52 mm) where egress is by level *aisles* and ramped *aisles*.

Exception: The required capacity in inches (mm) of *aisles* shall be permitted to comply with Section 1029.6.2 for the number of seats in the outdoor *smoke-protected assembly seating* where Section 1029.6.2 permits less capacity.

1029.7 Travel distance. *Exits* and *aisles* shall be so located that the travel distance to an *exit* door shall be not greater than 200 feet (60 960 mm) measured along the line of travel in nonsprinklered buildings. Travel distance shall be not more than 250 feet (76 200 mm) in sprinklered buildings. Where *aisles* are provided for seating, the distance shall be measured along the *aisles* and *aisle accessways* without travel over or on the seats.

Exceptions:

1. *Smoke-protected assembly seating:* The travel distance from each seat to the nearest entrance to a vomitory or concourse shall not exceed 200 feet (60 960 mm). The travel distance from the entrance to the vomitory or concourse to a *stairway*, *ramp* or walk on the exterior of the building shall not exceed 200 feet (60 960 mm).
2. Open-air seating: The travel distance from each seat to the building exterior shall not exceed 400 feet (122 m). The travel distance shall not be limited in facilities of Type I or II construction.

1029.8 Common path of egress travel. The *common path of egress travel* shall not exceed 30 feet (9144 mm) from any seat to a point where an occupant has a choice of two paths of egress travel to two *exits*.

Exceptions:

1. For areas serving less than 50 occupants, the *common path of egress travel* shall not exceed 75 feet (22 860 mm).
2. For *smoke-protected assembly seating*, the *common path of egress travel* shall not exceed 50 feet (15 240 mm).

1029.8.1 Path through adjacent row. Where one of the two paths of travel is across the *aisle* through a row of seats to another *aisle*, there shall be not more than 24 seats between the two *aisles*, and the minimum clear width between rows for the row between the two *aisles* shall be 12 inches (305 mm) plus 0.6 inch (15.2 mm) for each additional seat above seven in the row between *aisles*.

Exception: For *smoke-protected assembly seating* there shall be not more than 40 seats between the two *aisles* and the minimum clear width shall be 12 inches (305 mm) plus 0.3 inch (7.6 mm) for each additional seat.

1029.9 Assembly aisles are required. Every occupied portion of any building, room or space used for assembly pur-

poses that contains seats, tables, displays, similar fixtures or equipment shall be provided with *aisles* leading to *exits* or *exit access doorways* in accordance with this section.

1029.9.1 Minimum aisle width. The minimum clear width for *aisles* shall comply with one of the following:

1. Forty-eight inches (1219 mm) for stepped *aisles* having seating on each side.

Exception: Thirty-six inches (914 mm) where the stepped *aisles* serve less than 50 seats.

2. Thirty-six inches (914 mm) for stepped *aisles* having seating on only one side.

Exception: Twenty-three inches (584 mm) between a stepped *aisle handrail* and seating where a stepped *aisle* does not serve more than five rows on one side.

3. Twenty-three inches (584 mm) between a stepped *aisle handrail* or *guard* and seating where the stepped *aisle* is subdivided by a mid-*aisle handrail*.

4. Forty-two inches (1067 mm) for level or ramped *aisles* having seating on both sides.

Exceptions:

1. Thirty-six inches (914 mm) where the *aisle* serves less than 50 seats.
2. Thirty inches (762 mm) where the *aisle* does not serve more than 14 seats.
5. Thirty-six inches (914 mm) for level or ramped *aisles* having seating on only one side.

Exception: For other than ramped *aisles* that serve as part of an *accessible route*, 30 inches (762 mm) where the ramped *aisle* does not serve more than 14 seats.

1029.9.2 Aisle catchment area. The *aisle* shall provide sufficient capacity for the number of persons accommodated by the catchment area served by the *aisle*. The catchment area served by an *aisle* is that portion of the total space served by that section of the *aisle*. In establishing catchment areas, the assumption shall be made that there is a balanced use of all *means of egress*, with the number of persons in proportion to egress capacity.

1029.9.3 Converging aisles. Where *aisles* converge to form a single path of egress travel, the required capacity of that path shall be not less than the combined required capacity of the converging *aisles*.

1029.9.4 Uniform width and capacity. Those portions of *aisles*, where egress is possible in either of two directions, shall be uniform in minimum width or required capacity.

1029.9.5 Dead end aisles. Each end of an *aisle* shall be continuous to a cross *aisle*, foyer, doorway, vomitory, concourse or *stairway* in accordance with Section 1029.9.7 having access to an *exit*.

Exceptions:

1. Dead-end *aisles* shall be not greater than 20 feet (6096 mm) in length.

2. Dead-end *aisles* longer than 16 rows are permitted where seats beyond the 16th row dead-end *aisle* are not more than 24 seats from another *aisle*, measured along a row of seats having a minimum clear width of 12 inches (305 mm) plus 0.6 inch (15.2 mm) for each additional seat above seven in the row where seats have backrests or beyond 10 where seats are without backrests in the row.
3. For *smoke-protected assembly seating*, the dead end *aisle* length of vertical *aisles* shall not exceed a distance of 21 rows.
4. For *smoke-protected assembly seating*, a longer dead-end *aisle* is permitted where seats beyond the 21-row dead-end *aisle* are not more than 40 seats from another *aisle*, measured along a row of seats having an *aisle* accessway with a minimum clear width of 12 inches (305 mm) plus 0.3 inch (7.6 mm) for each additional seat above seven in the row where seats have backrests or beyond 10 where seats are without backrests in the row.

1029.9.6 Aisle measurement. The clear width for *aisles* shall be measured to walls, edges of seating and tread edges except for permitted projections.

Exception: The clear width of *aisles* adjacent to seating at tables shall be permitted to be measured in accordance with Section 1029.12.1.

1029.9.6.1 Assembly aisle obstructions. There shall not be obstructions in the minimum width or required capacity of *aisles*.

Exception: *Handrails* are permitted to project into the required width of stepped *aisles* and ramped *aisles* in accordance with Section 1014.8.

1029.9.7 Stairways connecting to stepped aisles. A *stairway* that connects a stepped *aisle* to a cross *aisle* or concourse shall be permitted to comply with the assembly *aisle* walking surface requirements of Section 1029.13. Transitions between *stairways* and stepped *aisles* shall comply with Section 1029.10.

1029.9.8 Stairways connecting to vomitories. A *stairway* that connects a vomitory to a cross *aisle* or concourse shall be permitted to comply with the assembly *aisle* walking surface requirements of Section 1029.13. Transitions between *stairways* and stepped *aisles* shall comply with Section 1029.10.

1029.10 Transitions. Transitions between *stairways* and stepped *aisles* shall comply with either Section 1029.10.1 or 1029.10.2.

1029.10.1 Transitions and stairways that maintain stepped aisle riser and tread dimensions. Stepped *aisles*, transitions and *stairways* that maintain riser and tread dimensions shall comply with Section 1029.13 as one *exit access* component.

1029.10.2 Transitions to stairways that do not maintain stepped aisle riser and tread dimensions. Transitions to *stairways* from stepped *aisles* with riser and tread dimen-

sions that differ from the *stairways* shall comply with Sections 1029.10.2.1 through 1029.10.3.

1029.10.2.1 Stairways and stepped aisles in a straight run. Transitions where the *stairway* is a straight run from the stepped *aisle* shall have a minimum depth of 22 inches (559 mm) where the treads on the descending side of the transition have greater depth and 30 inches (762 mm) where the treads on the descending side of the transition have lesser depth.

1029.10.2.2 Stairways and stepped aisles that change direction. Transitions where the *stairway* changes direction from the stepped *aisle* shall have a minimum depth of 11 inches (280 mm) or the stepped *aisle* tread depth, whichever is greater, between the stepped *aisle* and *stairway*.

1029.10.3 Transition marking. A distinctive marking stripe shall be provided at each *nosing* or leading edge adjacent to the transition. Such stripe shall be not less than 1 inch (25 mm), and not more than 2 inches (51 mm), wide. The edge marking stripe shall be distinctively different from the stepped *aisle* contrasting marking stripe.

1029.11 Construction. *Aisles*, stepped *aisles* and ramped *aisles* shall be built of materials consistent with the types permitted for the type of construction of the building.

Exception: Wood *handrails* shall be permitted for all types of construction.

1029.11.1 Walking surface. The surface of *aisles*, stepped *aisles* and ramped *aisles* shall be of slip-resistant materials that are securely attached. The surface for stepped *aisles* shall comply with Section 1011.7.1.

1029.11.2 Outdoor conditions. Outdoor *aisles*, stepped *aisles* and ramped *aisles* and outdoor approaches to *aisles*, stepped *aisles* and ramped *aisles* shall be designed so that water will not accumulate on the walking surface.

1029.12 Aisle accessways. *Aisle accessways* for seating at tables shall comply with Section 1029.12.1. *Aisle accessways* for seating in rows shall comply with Section 1029.12.2.

1029.12.1 Seating at tables. Where seating is located at a table or counter and is adjacent to an *aisle* or *aisle accessway*, the measurement of required clear width of the *aisle* or *aisle accessway* shall be made to a line 19 inches (483 mm) away from and parallel to the edge of the table or counter. The 19-inch (483 mm) distance shall be measured perpendicular to the side of the table or counter. In the case of other side boundaries for *aisles* or *aisle accessways*, the clear width shall be measured to walls, edges of seating and tread edges.

Exception: Where tables or counters are served by *fixed seats*, the width of the *aisle* or *aisle accessway* shall be measured from the back of the seat.

1029.12.1.1 Aisle accessway capacity and width for seating at tables. *Aisle accessways* serving arrangements of seating at tables or counters shall comply with the capacity requirements of Section 1005.1 but shall not have less than 12 inches (305 mm) of width plus $\frac{1}{2}$

inch (12.7 mm) of width for each additional 1 foot (305 mm), or fraction thereof, beyond 12 feet (3658 mm) of *aisle accessway* length measured from the center of the seat farthest from an *aisle*.

Exception: Portions of an *aisle accessway* having a length not exceeding 6 feet (1829 mm) and used by a total of not more than four persons.

1029.12.1.2 Seating at table aisle accessway length.

The length of travel along the *aisle accessway* shall not exceed 30 feet (9144 mm) from any seat to the point where a person has a choice of two or more paths of egress travel to separate *exits*.

1029.12.2 Clear width of aisle accessways serving seating in rows. Where seating rows have 14 or fewer seats, the minimum clear *aisle accessway* width shall be not less than 12 inches (305 mm) measured as the clear horizontal distance from the back of the row ahead and the nearest projection of the row behind. Where chairs have automatic or self-rising seats, the measurement shall be made with seats in the raised position. Where any chair in the row does not have an automatic or self-rising seat, the measurements shall be made with the seat in the down position. For seats with folding tablet arms, row spacing shall be determined with the tablet arm in the used position.

Exception: For seats with folding tablet arms, row spacing is permitted to be determined with the tablet arm in the stored position where the tablet arm when raised manually to vertical position in one motion automatically returns to the stored position by force of gravity.

1029.12.2.1 Dual access. For rows of seating served by *aisles* or doorways at both ends, there shall be not more than 100 seats per row. The minimum clear width of 12 inches (305 mm) between rows shall be increased by 0.3 inch (7.6 mm) for every additional seat beyond 14 seats where seats have backrests or beyond 21 where seats are without backrests. The minimum clear width is not required to exceed 22 inches (559 mm).

Exception: For *smoke-protected assembly seating*, the row length limits for a 12-inch-wide (305 mm) *aisle accessway*, beyond which the *aisle accessway*

minimum clear width shall be increased, are in Table 1029.12.2.1.

1029.12.2.2 Single access. For rows of seating served by an *aisle* or doorway at only one end of the row, the minimum clear width of 12 inches (305 mm) between rows shall be increased by 0.6 inch (15.2 mm) for every additional seat beyond seven seats where seats have backrests or beyond 10 where seats are without backrests. The minimum clear width is not required to exceed 22 inches (559 mm).

Exception: For *smoke-protected assembly seating*, the row length limits for a 12-inch-wide (305 mm) *aisle accessway*, beyond which the *aisle accessway* minimum clear width shall be increased, are in Table 1029.12.2.1.

1029.13 Assembly aisle walking surfaces. Ramped *aisles* shall comply with Sections 1029.13.1 through 1029.13.1.3. Stepped *aisles* shall comply with Sections 1029.13.2 through 1029.13.2.4.

1029.13.1 Ramped aisles. *Aisles* that are sloped more than one unit vertical in 20 units horizontal (5-percent slope) shall be considered a ramped *aisle*. Ramped *aisles* that serve as part of an *accessible route* in accordance with Sections 1009 and 1108.2 shall have a maximum slope of one unit vertical in 12 units horizontal (8-percent slope). The slope of other ramped *aisles* shall not exceed one unit vertical in 8 units horizontal (12.5-percent slope).

1029.13.1.1 Cross slope. The slope measured perpendicular to the direction of travel of a ramped *aisle* shall not be steeper than one unit vertical in 48 units horizontal (2-percent slope).

1029.13.1.2 Landings. Ramped *aisles* shall have landings in accordance with Sections 1012.6 through 1012.6.5. Landings for ramped *aisles* shall be permitted to overlap required *aisles* or cross *aisles*.

1029.13.1.3 Edge protection. Ramped *aisles* shall have edge protection in accordance with Sections 1012.10 and 1012.10.1.

Exception: In assembly spaces with *fixed seating*, edge protection is not required on the sides of ramped *aisles* where the ramped *aisles* provide access to the adjacent seating and *aisle accessways*.

**TABLE 1029.12.2.1
SMOKE-PROTECTED ASSEMBLY AISLE ACCESSWAYS**

| TOTAL NUMBER OF SEATS IN THE SMOKE-PROTECTED ASSEMBLY SEATING | MAXIMUM NUMBER OF SEATS PER ROW PERMITTED TO HAVE A MINIMUM 12-INCH CLEAR WIDTH AISLE ACCESSWAY | | | |
|---|---|-------------------------|---|-------------------------|
| | Aisle or doorway at both ends of row | | Aisle or doorway at one end of row only | |
| | Seats with backrests | Seats without backrests | Seats with backrests | Seats without backrests |
| Less than 4,000 | 14 | 21 | 7 | 10 |
| 4,000 | 15 | 22 | 7 | 10 |
| 7,000 | 16 | 23 | 8 | 11 |
| 10,000 | 17 | 24 | 8 | 11 |
| 13,000 | 18 | 25 | 9 | 12 |
| 16,000 | 19 | 26 | 9 | 12 |
| 19,000 | 20 | 27 | 10 | 13 |
| 22,000 and greater | 21 | 28 | 11 | 14 |

For SI: 1 inch = 25.4 mm.

1029.13.2 Stepped aisles. *Aisles* with a slope exceeding one unit vertical in eight units horizontal (12.5-percent slope) shall consist of a series of risers and treads that extends across the full width of *aisles* and complies with Sections 1029.13.2.1 through 1029.13.2.4.

1029.13.2.1 Treads. Tread depths shall be not less than 11 inches (279 mm) and shall have dimensional uniformity.

Exception: The tolerance between adjacent treads shall not exceed $\frac{3}{16}$ inch (4.8 mm).

1029.13.2.2 Risers. Where the gradient of stepped *aisles* is to be the same as the gradient of adjoining seating areas, the riser height shall be not less than 4 inches (102 mm) nor more than 8 inches (203 mm) and shall be uniform within each *flight*.

Exceptions:

1. Riser height nonuniformity shall be limited to the extent necessitated by changes in the gradient of the adjoining seating area to maintain adequate sightlines. Where nonuniformities exceed $\frac{3}{16}$ inch (4.8 mm) between adjacent risers, the exact location of such nonuniformities shall be indicated with a distinctive marking stripe on each tread at the *nosing* or leading edge adjacent to the nonuniform risers. Such stripe shall be not less than 1 inch (25 mm), and not more than 2 inches (51 mm), wide. The edge marking stripe shall be distinctively different from the contrasting marking stripe.
2. Riser heights not exceeding 9 inches (229 mm) shall be permitted where they are necessitated by the slope of the adjacent seating areas to maintain sightlines.

1029.13.2.2.1 Construction tolerances. The tolerance between adjacent risers on a stepped *aisle* that were designed to be equal height shall not exceed $\frac{3}{16}$ inch (4.8 mm). Where the stepped *aisle* is designed in accordance with Exception 1 of Section 1029.13.2.2, the stepped *aisle* shall be constructed so that each riser of unequal height, determined in the direction of descent, is not more than $\frac{3}{8}$ inch (9.5 mm) in height different from adjacent risers where stepped *aisle* treads are less than 22 inches (560 mm) in depth and $\frac{3}{4}$ inch (19.1 mm) in height different from adjacent risers where stepped *aisle* treads are 22 inches (560 mm) or greater in depth.

1029.13.2.3 Tread contrasting marking stripe. A contrasting marking stripe shall be provided on each tread at the *nosing* or leading edge such that the location of each tread is readily apparent when viewed in descent. Such stripe shall be not less than 1 inch (25 mm), and not more than 2 inches (51 mm), wide.

Exception: The contrasting marking stripe is permitted to be omitted where tread surfaces are such that the location of each tread is readily apparent when viewed in descent.

1029.13.2.4 Nosing and profile. *Nosing* and riser profile shall comply with Sections 1011.5.5 through 1011.5.5.3.

1029.14 Seat stability. In a building, room or space used for assembly purposes, the seats shall be securely fastened to the floor.

Exceptions:

1. In a building, room or space used for assembly purposes or portions thereof without ramped or tiered floors for seating and with 200 or fewer seats, the seats shall not be required to be fastened to the floor.
2. In a building, room or space used for assembly purposes or portions thereof with seating at tables and without ramped or tiered floors for seating, the seats shall not be required to be fastened to the floor.
3. In a building, room or space used for assembly purposes or portions thereof without ramped or tiered floors for seating and with greater than 200 seats, the seats shall be fastened together in groups of not less than three or the seats shall be securely fastened to the floor.
4. In a building, room or space used for assembly purposes where flexibility of the seating arrangement is an integral part of the design and function of the space and seating is on tiered levels, not more than 200 seats shall not be required to be fastened to the floor. Plans showing seating, tiers and *aisles* shall be submitted for approval.
5. Groups of seats within a building, room or space used for assembly purposes separated from other seating by railings, *guards*, partial height walls or similar barriers with level floors and having not more than 14 seats per group shall not be required to be fastened to the floor.
6. Seats intended for musicians or other performers and separated by railings, *guards*, partial height walls or similar barriers shall not be required to be fastened to the floor.

1029.15 Handrails. Ramped *aisles* having a slope exceeding one unit vertical in 15 units horizontal (6.7-percent slope) and stepped *aisles* shall be provided with *handrails* in compliance with Section 1014 located either at one or both sides of the *aisle* or within the *aisle* width.

Exceptions:

1. *Handrails* are not required for ramped *aisles* with seating on both sides.
2. *Handrails* are not required where, at the side of the *aisle*, there is a *guard* with a top surface that complies with the graspability requirements of *handrails* in accordance with Section 1014.3.
3. *Handrail* extensions are not required at the top and bottom of stepped *aisles* and ramped *aisles* to permit crossovers within the *aisles*.

1029.15.1 Discontinuous handrails. Where there is seating on both sides of the *aisle*, the mid-*aisle handrails* shall

be discontinuous with gaps or breaks at intervals not exceeding five rows to facilitate access to seating and to permit crossing from one side of the *aisle* to the other. These gaps or breaks shall have a clear width of not less than 22 inches (559 mm) and not greater than 36 inches (914 mm), measured horizontally, and the mid-aisle *handrail* shall have rounded terminations or bends.

1029.15.2 Handrail termination. *Handrails* located on the side of stepped *aisles* shall return to a wall, *guard* or the walking surface or shall be continuous to the *handrail* of an adjacent stepped *aisle flight*.

1029.15.3 Mid-aisle termination. Mid-aisle *handrails* shall not extend beyond the lowest riser and shall terminate within 18 inches (381 mm), measured horizontally, from the lowest riser. *Handrail* extensions are not required.

Exception: Mid-aisle *handrails* shall be permitted to extend beyond the lowest riser where the *handrail* extensions do not obstruct the width of the cross *aisle*.

1029.15.4 Rails. Where mid-aisle *handrails* are provided in stepped *aisles*, there shall be an additional rail located approximately 12 inches (305 mm) below the *handrail*. The rail shall be adequate in strength and attachment in accordance with Section 1607.8.1.2.

1029.16 Assembly guards. *Guards* adjacent to seating in a building, room or space used for assembly purposes shall be provided where required by Section 1015 and shall be constructed in accordance with Section 1015 except where provided in accordance with Sections 1029.16.1 through 1029.16.4. At *bleachers*, *grandstands* and *folding and telescopic seating*, *guards* must be provided where required by ICC 300 and Section 1029.16.1.

1029.16.1 Perimeter guards. Perimeter *guards* shall be provided where the footboards or walking surface of seating facilities are more than 30 inches (762 mm) above the floor or grade below. Where the seatboards are adjacent to the perimeter, *guard* height shall be 42 inches (1067 mm) high minimum, measured from the seatboard. Where the seats are self-rising, *guard* height shall be 42 inches (1067 mm) high minimum, measured from the floor surface. Where there is an *aisle* between the seating and the perimeter, the *guard* height shall be measured in accordance with Section 1015.2.

Exceptions:

1. *Guards* that impact sightlines shall be permitted to comply with Section 1029.16.3.
2. *Bleachers*, *grandstands* and *folding and telescopic seating* shall not be required to have perimeter *guards* where the seating is located adjacent to a wall and the space between the wall and the seating is less than 4 inches (102 mm).

1029.16.2 Cross aisles. Cross *aisles* located more than 30 inches (762 mm) above the floor or grade below shall have *guards* in accordance with Section 1015.

Where an elevation change of 30 inches (762 mm) or less occurs between a cross *aisle* and the adjacent floor or grade below, *guards* not less than 26 inches (660 mm) above the *aisle* floor shall be provided.

Exception: Where the backs of seats on the front of the cross *aisle* project 24 inches (610 mm) or more above the adjacent floor of the *aisle*, a *guard* need not be provided.

1029.16.3 Sightline-constrained guard heights. Unless subject to the requirements of Section 1029.16.4, a fascia or railing system in accordance with the *guard* requirements of Section 1015 and having a minimum height of 26 inches (660 mm) shall be provided where the floor or footboard elevation is more than 30 inches (762 mm) above the floor or grade below and the fascia or railing would otherwise interfere with the sightlines of immediately adjacent seating.

1029.16.4 Guards at the end of aisles. A fascia or railing system complying with the *guard* requirements of Section 1015 shall be provided for the full width of the *aisle* where the foot of the *aisle* is more than 30 inches (762 mm) above the floor or grade below. The fascia or railing shall be a minimum of 36 inches (914 mm) high and shall provide a minimum 42 inches (1067 mm) measured diagonally between the top of the rail and the *nosing* of the nearest tread.

SECTION 1030 EMERGENCY ESCAPE AND RESCUE

1030.1 General. In addition to the *means of egress* required by this chapter, provisions shall be made for *emergency escape and rescue openings* in Group R-2 occupancies in accordance with Tables 1006.3.2(1) and 1006.3.2(2) and Group R-3 occupancies. *Basements* and sleeping rooms below the fourth story above *grade plane* shall have at least one exterior *emergency escape and rescue opening* in accordance with this section. Where *basements* contain one or more sleeping rooms, *emergency escape and rescue openings* shall be required in each sleeping room, but shall not be required in adjoining areas of the *basement*. Such openings shall open directly into a *public way* or to a *yard* or *court* that opens to a *public way*.

Exceptions:

1. *Basements* with a ceiling height of less than 80 inches (2032 mm) shall not be required to have *emergency escape and rescue openings*.
2. *Emergency escape and rescue openings* are not required from *basements* or sleeping rooms that have an *exit door* or *exit access door* that opens directly into a *public way* or to a *yard*, *court* or exterior *exit balcony* that opens to a *public way*.
3. *Basements* without *habitable spaces* and having not more than 200 square feet (18.6 m²) in floor area shall not be required to have *emergency escape and rescue openings*.

4. Where access to a *public way* cannot be provided, a safe dispersal area shall be provided where all of the following are met:
 1. The area shall be of a size to accommodate at least 5 square feet (0.46 m²) for each person.
 2. The area shall be located on the same *lot* at least 25 feet (7620 mm) away from the *building* requiring egress.
 3. The area shall be permanently maintained and identified as a safe dispersal area.
 4. The area shall be provided with a safe and unobstructed path of travel from the *building*.

1030.2 Minimum size. *Emergency escape and rescue openings* shall have a minimum net clear opening of 5.7 square feet (0.53 m²).

Exception: The minimum net clear opening for grade-floor *emergency escape and rescue openings* shall be 5 square feet (0.46 m²).

1030.2.1 Minimum dimensions. The minimum net clear opening height dimension shall be 24 inches (610 mm). The minimum net clear opening width dimension shall be 20 inches (508 mm). The net clear opening dimensions shall be the result of normal operation of the opening.

1030.3 Maximum height from floor. *Emergency escape and rescue openings* shall have the bottom of the clear opening not greater than 44 inches (1118 mm) measured from the floor.

1030.4 Operational constraints. *Emergency escape and rescue openings* shall be operational from the inside of the room without the use of keys or tools. Bars, grilles, grates or similar devices are permitted to be placed over *emergency escape and rescue openings* provided the minimum net clear opening size complies with Section 1030.2 and such devices shall be releasable or removable from the inside without the use of a key, tool or force greater than that which is required for normal operation of the *emergency escape and rescue opening*. Where such bars, grilles, grates or similar devices are installed in existing buildings, *smoke alarms* shall be installed in accordance with Section 907.2.11 regardless of the valuation of the *alteration*.

1030.5 Window wells. An *emergency escape and rescue opening* with a finished sill height below the adjacent ground level shall be provided with a window well in accordance with Sections 1030.5.1 and 1030.5.2.

1030.5.1 Minimum size. The minimum horizontal area of the window well shall be 9 square feet (0.84 m²), with a minimum dimension of 36 inches (914 mm). The area of the window well shall allow the *emergency escape and rescue opening* to be fully opened.

1030.5.2 Ladders or steps. Window wells with a vertical depth of more than 44 inches (1118 mm) shall be equipped with an *approved* permanently affixed ladder or steps. Ladders or rungs shall have an inside width of at least 12 inches (305 mm), shall project at least 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches

(457 mm) on center (o.c.) vertically for the full height of the window well. The ladder or steps shall not encroach into the required dimensions of the window well by more than 6 inches (152 mm). The ladder or steps shall not be obstructed by the *emergency escape and rescue opening*. Ladders or steps required by this section are exempt from the *stairway* requirements of Section 1011.

CHAPTER 11

ACCESSIBILITY

SECTION 1101 GENERAL

1101.1 Scope. The provisions of Chapter 11 of the *Building Code* and Appendix E (except Section E110, Airports) of the *International Building Code*, as amended, shall control the design and construction of facilities for accessibility to persons with physical disabilities. Appendix E of the *International Building Code*, as amended, is adopted as Appendix E of the *Building Code*.

1101.2 Design. Buildings and facilities shall be designed and constructed to be *accessible* in accordance with this code and ICC A117.1.

1101.3 Fractional numbers. Fractional numbers resulting from applying the calculations and percentages in Section 1107 shall be rounded up to the next whole number.

SECTION 1102 DEFINITIONS

1102.1 Definitions. The following terms are defined in Chapter 2:

ACCESSIBLE.

ACCESSIBLE ROUTE.

ACCESSIBLE UNIT.

AREA OF SPORT ACTIVITY.

CIRCULATION PATH.

COMMON USE.

DETECTABLE WARNING.

EMPLOYEE WORK AREA.

FACILITY.

INTENDED TO BE OCCUPIED AS A RESIDENCE.

MULTILEVEL ASSEMBLY SEATING.

MULTISTORY UNIT.

PUBLIC ENTRANCE.

PUBLIC-USE AREAS.

RESTRICTED ENTRANCE.

SELF-SERVICE STORAGE FACILITY.

SERVICE ENTRANCE.

SITE.

TYPE A UNIT.

TYPE B UNIT.

WHEELCHAIR SPACE.

SECTION 1103 SCOPING REQUIREMENTS

1103.1 Where required. *Sites*, buildings, *structures*, *facilities*, elements and spaces, temporary or permanent, shall be *accessible* to individuals with disabilities.

1103.2 General exceptions. *Sites*, buildings, *structures*, *facilities*, elements and spaces shall be exempt from this chapter to the extent specified in this section.

1103.2.1 Specific requirements. *Accessibility* is not required in buildings and *facilities*, or portions thereof, to the extent permitted by Sections 1104 through 1111.

1103.2.2 Employee work areas. Spaces and elements within *employee work areas* shall only be required to comply with Sections 907.5.2.3.1, 1009 and 1104.3.1 and shall be designed and constructed so that individuals with disabilities can approach, enter and exit the work area. Work areas, or portions of work areas, other than raised courtroom stations in accordance with Section 1108.4.1.4, that are less than 300 square feet (30 m²) in area and located 7 inches (178 mm) or more above or below the ground or finished floor where the change in elevation is essential to the function of the space shall be exempt from all requirements.

1103.2.3 Detached dwellings. Detached one- and two-family *dwellings*, their accessory structures and their associated *sites* and *facilities* are not required to comply with this chapter.

1103.2.4 Utility buildings. Group U occupancies are not required to comply with this chapter other than the following:

1. In agricultural buildings, access is required to paved work areas and areas open to the general public.
2. Private garages or carports that contain required *accessible* parking.

1103.2.5 Construction sites. Structures, *sites* and equipment directly associated with the actual processes of construction including, but not limited to, scaffolding, bridging, materials hoists, materials storage or construction trailers are not required to comply with this chapter.

1103.2.6 Raised areas. Raised areas used primarily for purposes of security, life safety or fire safety including, but not limited to, observation galleries, prison guard towers, fire towers or lifeguard stands are not required to comply with this chapter.

1103.2.7 Limited access spaces. Spaces accessed only by ladders, catwalks, crawl spaces, freight elevators or very narrow passageways are not required to comply with this chapter.

1103.2.8 Areas in places of religious worship. Raised or lowered areas, or portions of areas, in *places of religious worship* that are less than 300 square feet (30 m²) in area and located 7 inches (178 mm) or more above or below the finished floor and used primarily for the performance of religious ceremonies are not required to comply with this chapter.

1103.2.9 Equipment spaces. Spaces frequented only by personnel for maintenance, repair or monitoring of equipment are not required to be accessible. Such spaces include, but are not limited to, elevator pits, elevator penthouses, mechanical, electrical or communications equipment rooms, piping or equipment catwalks, water or sewage treatment pump rooms and stations, electric sub-stations and transformer vaults, and highway and tunnel utility facilities.

1103.2.10 Highway tollbooths. Highway tollbooths where the access is provided only by bridges above the vehicular traffic or underground tunnels are not required to comply with this chapter.

1103.2.11 Residential Group R-1. Buildings of Group R-1 containing not more than five *sleeping units* for rent or hire that are also occupied as the residence of the proprietor are not required to comply with this chapter.

1103.2.12 Day care facilities. Where a day care facility is part of a *dwelling unit*, only the portion of the structure utilized for the day care facility is required to comply with this chapter.

1103.2.13 Detention and correctional facilities. In detention and correctional facilities, *common use* areas that are used only by inmates or detainees and security personnel, and that do not serve holding cells or housing cells required to be *Accessible units*, are not required to comply with this chapter.

1103.2.14 Walk-in coolers and freezers. Walk-in coolers and freezers intended for employee use only are not required to comply with this chapter.

1103.2.15 Existing buildings. Existing buildings shall comply with the *Existing Building Code*.

SECTION 1104 ACCESSIBLE ROUTE

1104.1 Site arrival points. At least one *accessible route* within the *site* shall be provided from public transportation stops, *accessible parking*, *accessible passenger loading zones*, and public streets or sidewalks to the *accessible building entrance* served.

Exception: Other than in buildings or *facilities* containing or serving *Type B units*, an *accessible route* shall not be required between *site arrival points* and the building or

facility entrance if the only means of access between them is a vehicular way not providing for pedestrian access.

1104.2 Within a site. At least one *accessible route* shall connect *accessible buildings*, *accessible facilities*, *accessible elements* and *accessible spaces* that are on the same *site*.

Exceptions:

1. An *accessible route* is not required between *accessible buildings*, *accessible facilities*, *accessible elements* and *accessible spaces* that have, as the only means of access between them, a vehicular way not providing for pedestrian access.
2. An *accessible route* to recreational facilities shall only be required to the extent specified in Section 1110.

1104.3 Connected spaces. When a building or portion of a building is required to be *accessible*, at least one *accessible route* shall be provided to each portion of the building, to *accessible building entrances* connecting *accessible pedestrian walkways* and to the *public way*.

Exceptions:

1. *Stories* and *mezzanines* exempted by Section 1104.4.
2. In a building, room or space used for assembly purposes with *fixed seating*, an *accessible route* shall not be required to serve levels where *wheelchair spaces* are not provided.
3. Vertical access to elevated employee work stations within a courtroom complying with Section 1108.4.1.4.
4. An *accessible route* to recreational facilities shall only be required to the extent specified in Section 1110.

1104.3.1 Employee work areas. *Common use circulation paths* within *employee work areas* shall be *accessible routes*.

Exceptions:

1. *Common use circulation paths*, located within *employee work areas* that are less than 1,000 square feet (93 m²) in size and defined by permanently installed partitions, counters, casework or furnishings, shall not be required to be *accessible routes*.
2. *Common use circulation paths*, located within *employee work areas*, that are an integral component of equipment, shall not be required to be *accessible routes*.
3. *Common use circulation paths*, located within exterior *employee work areas* that are fully exposed to the weather, shall not be required to be *accessible routes*.

1104.3.2 Press boxes. Press boxes in a building, room or space used for assembly purposes shall be on an *accessible route*.

Exceptions:

1. An *accessible route* shall not be required to press boxes in *bleachers* that have a single point of entry from the *bleachers*, provided that the aggregate area of all press boxes for each playing field is not more than 500 square feet (46 m²).
2. An *accessible route* shall not be required to free-standing press boxes that are more than 12 feet (3660 mm) above grade provided that the aggregate area of all press boxes for each playing field is not more than 500 square feet (46 m²).

1104.4 Multistory buildings and facilities. At least one *accessible route* shall connect each *accessible story* and *mezzanine* in multilevel buildings and *facilities*.

Exceptions:

1. An *accessible route* is not required to *stories* and *mezzanines* that have an aggregate area of not more than 3,000 square feet (278.7 m²) and are located above and below *accessible levels*. This exception shall not apply to:
 - 1.1. Multiple tenant facilities of Group M occupancies containing five or more tenant spaces used for the sales or rental of goods and where at least one such tenant space is located on a floor level above or below the *accessible levels*;
 - 1.2. *Stories* or *mezzanines* containing offices of health care providers (Group B or I);
 - 1.3. Passenger transportation facilities and airports (Group A-3 or B); or
 - 1.4. Government buildings.
2. *Stories* or *mezzanines* that do not contain *accessible* elements or other spaces as determined by Section 1107 or 1108 are not required to be served by an *accessible route* from an *accessible level*.
3. In air traffic control towers, an *accessible route* is not required to serve the cab and the floor immediately below the cab.
4. Where a two-story building or facility has one *story* or *mezzanine* with an *occupant load* of five or fewer persons that does not contain *public use* space, that *story* or *mezzanine* shall not be required to be connected by an *accessible route* to the *story* above or below.

1104.5 Location. *Accessible routes* shall coincide with or be located in the same area as a general *circulation path*. Where the *circulation path* is interior, the *accessible route* shall also be interior. Where only one *accessible route* is provided, the

accessible route shall not pass through kitchens, storage rooms, restrooms, closets or similar spaces.

Exceptions:

1. *Accessible routes* from parking garages contained within and serving *Type B units* are not required to be interior.
2. A single *accessible route* is permitted to pass through a kitchen or storage room in an *Accessible unit*, *Type A unit* or *Type B unit*.

1104.6 Security barriers. Security barriers including, but not limited to, security bollards and security check points shall not obstruct a required *accessible route* or *accessible means of egress*.

Exception: Where security barriers incorporate elements that cannot comply with these requirements, such as certain metal detectors, fluoroscopes or other similar devices, the *accessible route* shall be permitted to be provided adjacent to security screening devices. The *accessible route* shall permit persons with disabilities passing around security barriers to maintain visual contact with their personal items to the same extent provided others passing through the security barrier.

SECTION 1105 ACCESSIBLE ENTRANCES

1105.1 Public entrances. In addition to *accessible* entrances required by Sections 1105.1.1 through 1105.1.7, at least 60 percent of all *public entrances* shall be *accessible*.

Exceptions:

1. An *accessible* entrance is not required to areas not required to be *accessible*.
2. Loading and *service entrances* that are not the only entrance to a tenant space.

1105.1.1 Parking garage entrances. Where provided, direct access for pedestrians from parking structures to buildings or facility entrances shall be *accessible*.

1105.1.2 Entrances from tunnels or elevated walkways. Where direct access is provided for pedestrians from a pedestrian tunnel or elevated walkway to a building or facility, at least one entrance to the building or facility from each tunnel or walkway shall be *accessible*.

1105.1.3 Restricted entrances. Where *restricted entrances* are provided to a building or facility, at least one *restricted entrance* to the building or facility shall be *accessible*.

1105.1.4 Entrances for inmates or detainees. Where entrances used only by inmates or detainees and security personnel are provided at judicial facilities, detention facilities or correctional facilities, at least one such entrance shall be *accessible*.

1105.1.5 Service entrances. If a *service entrance* is the only entrance to a building or a tenant space in a facility, that entrance shall be *accessible*.

1105.1.6 Tenant spaces. At least one *accessible* entrance shall be provided to each tenant in a facility.

Exception: An *accessible* entrance is not required to self-service storage facilities that are not required to be *accessible*.

1105.1.7 Dwelling units and sleeping units. At least one *accessible* entrance shall be provided to each *dwelling unit* and *sleeping unit* in a facility.

Exception: An *accessible* entrance is not required to *dwelling units* and *sleeping units* that are not required to be *Accessible units*, *Type A units* or *Type B units*.

SECTION 1106 PARKING AND PASSENGER LOADING FACILITIES

1106.1 Required. Where parking is provided, *accessible* parking spaces shall be provided in compliance with Table 1106.1, except as required by Sections 1106.2 through 1106.4. Where more than one parking facility is provided on a *site*, the number of parking spaces required to be *accessible* shall be calculated separately for each parking facility.

Exception: This section does not apply to parking spaces used exclusively for buses, trucks, other delivery vehicles, law enforcement vehicles or vehicular impound and motor pools where lots accessed by the public are provided with an *accessible* passenger loading zone.

TABLE 1106.1
ACCESSIBLE PARKING SPACES

| TOTAL PARKING SPACES PROVIDED IN PARKING FACILITIES | REQUIRED MINIMUM NUMBER OF ACCESSIBLE SPACES |
|---|--|
| 1 to 25 | 1 |
| 26 to 50 | 2 |
| 51 to 75 | 3 |
| 76 to 100 | 4 |
| 101 to 150 | 5 |
| 151 to 200 | 6 |
| 201 to 300 | 7 |
| 301 to 400 | 8 |
| 401 to 500 | 9 |
| 501 to 1,000 | 2% of total |
| 1,001 and over | 20, plus one for each 100, or fraction thereof, over 1,000 |

1106.2 Groups I-1, R-1, R-2, R-3 and R-4. *Accessible* parking spaces shall be provided in Group I-1, R-1, R-2, R-3 and R-4 occupancies in accordance with Items 1 through 4 as applicable.

1. In Group R-2, R-3 and R-4 occupancies that are required to have *Accessible*, *Type A* or *Type B dwelling units* or *sleeping units*, at least 2 percent, but not less than one, of each type of parking space provided shall be *accessible*.

2. In Group I-1 and R-1 occupancies, *accessible* parking shall be provided in accordance with Table 1106.1.

3. Where at least one parking space is provided for each *dwelling unit* or *sleeping unit*, at least one *accessible* parking space shall be provided for each *Accessible* and *Type A unit*.

4. Where parking is provided within or beneath a building, *accessible* parking spaces shall also be provided within or beneath the building.

1106.3 Hospital outpatient facilities. At least 10 percent, but not less than one, of care recipient and visitor parking spaces provided to serve hospital outpatient facilities shall be *accessible*.

1106.4 Rehabilitation facilities and outpatient physical therapy facilities. At least 20 percent, but not less than one, of the portion of care recipient and visitor parking spaces serving rehabilitation facilities specializing in treating conditions that affect mobility and outpatient physical therapy facilities shall be *accessible*.

1106.5 Van spaces. For every six or fraction of six *accessible* parking spaces, at least one shall be a van-accessible parking space.

Exception: In Group R-2 and R-3 occupancies, van-accessible spaces located within private garages shall be permitted to have vehicular routes, entrances, parking spaces and access aisles with a minimum vertical clearance of 7 feet (2134 mm).

1106.6 Location. *Accessible* parking spaces shall be located on the shortest *accessible route* of travel from adjacent parking to an *accessible* building entrance. In parking facilities that do not serve a particular building, *accessible* parking spaces shall be located on the shortest route to an *accessible* pedestrian entrance to the parking facility. Where buildings have multiple *accessible* entrances with adjacent parking, *accessible* parking spaces shall be dispersed and located near the *accessible* entrances.

Exceptions:

1. In multilevel parking structures, van-accessible parking spaces are permitted on one level.
2. *Accessible* parking spaces shall be permitted to be located in different parking facilities if substantially equivalent or greater accessibility is provided in terms of distance from an *accessible* entrance or entrances, parking fee and user convenience.

1106.7 Passenger loading zones. Passenger loading zones shall be *accessible*.

1106.7.1 Continuous loading zones. Where passenger loading zones are provided, one passenger loading zone in every continuous 100 linear feet (30.4 m) maximum of loading zone space shall be *accessible*.

1106.7.2 Medical facilities. A passenger loading zone shall be provided at an *accessible* entrance to licensed medical and long-term care facilities where people receive physical or medical treatment or care and where the period of stay exceeds 24 hours.

1106.7.3 Valet parking. A passenger loading zone shall be provided at valet parking services.

1106.7.4 Mechanical access parking garages. Mechanical access parking garages shall provide at least one passenger loading zone at vehicle drop-off and vehicle pick-up areas.

SECTION 1107 DWELLING UNITS AND SLEEPING UNITS

1107.1 General. In addition to the other requirements of this chapter, occupancies having *dwelling units* or *sleeping units* shall be provided with *accessible* features in accordance with this section.

1107.2 Design. *Dwelling units* and *sleeping units* that are required to be *Accessible units*, *Type A units* and *Type B units* shall comply with the applicable portions of Chapter 10 of ICC A117.1. Units required to be *Type A units* are permitted to be designed and constructed as *Accessible units*. Units required to be *Type B units* are permitted to be designed and constructed as *Accessible units* or as *Type A units*.

1107.3 Accessible spaces. Rooms and spaces available to the general public or available for use by residents and serving *Accessible units*, *Type A units* or *Type B units* shall be *accessible*. *Accessible* spaces shall include toilet and bathing rooms, kitchen, living and dining areas and any exterior spaces, including patios, terraces and balconies.

Exceptions:

1. *Stories* and *mezzanines* exempted by Section 1107.4.
2. Recreational facilities in accordance with Section 110.2.
3. Exterior decks, patios or balconies that are part of *Type B units* and have impervious surfaces, and that are not more than 4 inches (102 mm) below the finished floor level of the adjacent interior space of the unit.

1107.4 Accessible route. At least one *accessible route* shall connect *accessible* building or facility entrances with the primary entrance of each *Accessible unit*, *Type A unit* and *Type B unit* within the building or facility and with those exterior and interior spaces and facilities that serve the units.

Exceptions:

1. If due to circumstances outside the control of the owner, either the slope of the finished ground level between *accessible* facilities and buildings exceeds one unit vertical in 12 units horizontal (1:12), or where physical barriers or legal restrictions prevent the installation of an *accessible route*, a vehicular route with parking that complies with Section 1106 at each *public* or *common use* facility or building is permitted in place of the *accessible route*.
2. In Group I-3 facilities, an *accessible route* is not required to connect *stories* or *mezzanines* where *Accessible units*, all *common use* areas serving

Accessible units and all *public use* areas are on an *accessible route*.

3. In Group R-2 facilities with *Type A units* complying with Section 1107.6.2.2.1, an *accessible route* is not required to connect *stories* or *mezzanines* where *Type A units*, all *common use* areas serving *Type A units* and all *public use* areas are on an *accessible route*.
4. In other than Group R-2 dormitory housing provided by places of education, in Group R-2 facilities with *Accessible units* complying with Section 1107.6.2.3.1, an *accessible route* is not required to connect *stories* or *mezzanines* where *Accessible units*, all *common use* areas serving *Accessible units* and all *public use* areas are on an *accessible route*.
5. In Group R-1, an *accessible route* is not required to connect *stories* or *mezzanines* within individual units, provided the *accessible* level meets the provisions for *Accessible units* and sleeping accommodations for two persons minimum and a toilet facility are provided on that level.
6. In congregate residences in Groups R-3 and R-4, an *accessible route* is not required to connect *stories* or *mezzanines* where *Accessible units* or *Type B units*, all *common use* areas serving *Accessible units* and *Type B units* and all *public use* areas serving *Accessible units* and *Type B units* are on an *accessible route*.
7. An *accessible route* between *stories* is not required where *Type B units* are exempted by Section 1107.7.

1107.5 Group I. *Accessible units* and *Type B units* shall be provided in Group I occupancies in accordance with Sections 1107.5.1 through 1107.5.5.

1107.5.1 Group I-1. *Accessible units* and *Type B units* shall be provided in Group I-1 occupancies in accordance with Sections 1107.5.1.1 and 1107.5.1.2.

1107.5.1.1 Accessible units. In Group I-1 Condition 1, at least 4 percent, but not less than one, of the *dwelling units* and *sleeping units* shall be *Accessible units*. In Group I-1 Condition 2, at least 10 percent, but not less than one, of the *dwelling units* and *sleeping units* shall be *Accessible units*.

1107.5.1.2 Type B units. In structures with four or more *dwelling units* or *sleeping units intended to be occupied as a residence*, every *dwelling unit* and *sleeping unit intended to be occupied as a residence* shall be a *Type B unit*.

Exception: The number of *Type B units* is permitted to be reduced in accordance with Section 1107.7.

1107.5.2 Group I-2 nursing homes. *Accessible units* and *Type B units* shall be provided in nursing homes of Group I-2 occupancies in accordance with Sections 1107.5.2.1 and 1107.5.2.2.

1107.5.2.1 Accessible units. At least 50 percent but not less than one of each type of the *dwelling units* and *sleeping units* shall be *Accessible units*.

1107.5.2.2 Type B units. In structures with four or more *dwelling units* or *sleeping units intended to be occupied as a residence*, every *dwelling unit* and *sleeping unit intended to be occupied as a residence* shall be a *Type B unit*.

Exception: The number of *Type B units* is permitted to be reduced in accordance with Section 1107.7.

1107.5.3 Group I-2 hospitals. *Accessible units* and *Type B units* shall be provided in general-purpose hospitals, psychiatric facilities and detoxification facilities of Group I-2 occupancies in accordance with Sections 1107.5.3.1 and 1107.5.3.2.

1107.5.3.1 Accessible units. At least 10 percent, but not less than one, of the *dwelling units* and *sleeping units* shall be *Accessible units*.

Exception: Entry doors to *Accessible dwelling units* or *sleeping units* shall not be required to provide the maneuvering clearance beyond the latch side of the door.

1107.5.3.2 Type B units. In structures with four or more *dwelling units* or *sleeping units intended to be occupied as a residence*, every *dwelling unit* and *sleeping unit intended to be occupied as a residence* shall be a *Type B unit*.

Exception: The number of *Type B units* is permitted to be reduced in accordance with Section 1107.7.

1107.5.4 Group I-2 rehabilitation facilities. In hospitals and rehabilitation facilities of Group I-2 occupancies that specialize in treating conditions that affect mobility, or units within either that specialize in treating conditions that affect mobility, 100 percent of the *dwelling units* and *sleeping units* shall be *Accessible units*.

1107.5.5 Group I-3. *Accessible units* shall be provided in Group I-3 occupancies in accordance with Sections 1107.5.5.1 through 1107.5.5.3.

1107.5.5.1 Group I-3 sleeping units. In Group I-3 occupancies, at least 5 percent of the *sleeping units*, but not less than one unit, shall be *Accessible units*.

1107.5.5.2 Special holding cells and special housing cells or rooms. In addition to the *Accessible units* required by Section 1107.5.5.1, where special holding cells or special housing cells or rooms are provided, at least one serving each purpose shall be an *Accessible unit*. Cells or rooms subject to this requirement include, but are not limited to, those used for purposes of orientation, protective custody, administrative or disciplinary detention or segregation, detoxification and medical isolation.

Exception: Cells or rooms specially designed without protrusions and that are used solely for purposes of suicide prevention shall not be required to include grab bars.

1107.5.5.3 Medical care facilities. Patient *sleeping units* or cells required to be *Accessible units* in medical care facilities shall be provided in addition to any medical isolation cells required to comply with Section 1107.5.5.2.

1107.6 Group R. *Accessible units*, *Type A units* and *Type B units* shall be provided in Group R occupancies in accordance with Sections 1107.6.1 through 1107.6.4.

1107.6.1 Group R-1. *Accessible units* and *Type B units* shall be provided in Group R-1 occupancies in accordance with Sections 1107.6.1.1 and 1107.6.1.2.

1107.6.1.1 Accessible units. *Accessible dwelling units* and *sleeping units* shall be provided in accordance with Table 1107.6.1.1. In order to determine the total number of *Accessible units*, all *dwelling units* and *sleeping units* on a site shall be considered. *Accessible units* shall be dispersed among the various classes of units. At least one *Accessible unit* shall also provide communication features complying with Appendix E, Section

TABLE 1107.6.1.1
ACCESSIBLE DWELLING UNITS AND SLEEPING UNITS

| TOTAL NUMBER OF UNITS PROVIDED | MINIMUM REQUIRED NUMBER OF ACCESSIBLE UNITS WITHOUT ROLL-IN SHOWERS | MINIMUM REQUIRED NUMBER OF ACCESSIBLE UNITS WITH ROLL-IN SHOWERS | TOTAL NUMBER OF REQUIRED ACCESSIBLE UNITS |
|--------------------------------|---|--|---|
| 1 to 25 | 1 | 0 | 1 |
| 26 to 50 | 2 | 0 | 2 |
| 51 to 75 | 3 | 1 | 4 |
| 76 to 100 | 4 | 1 | 5 |
| 101 to 150 | 5 | 2 | 7 |
| 151 to 200 | 6 | 2 | 8 |
| 201 to 300 | 7 | 3 | 10 |
| 301 to 400 | 8 | 4 | 12 |
| 401 to 500 | 9 | 4 | 13 |
| 501 to 1,000 | 2% of total | 1% of total | 3% of total |
| Over 1,000 | 20, plus 1 for each 100, or fraction thereof, over 1,000 | 10 plus 1 for each 100, or fraction thereof, over 1,000 | 30 plus 2 for each 100, or fraction thereof, over 1,000 |

E104.2. Not more than 10 percent of *Accessible units* shall be used to satisfy the minimum number of units required to provide communication features complying with Appendix E, Section E104.2. Roll-in showers provided in accessible units shall include a permanently mounted folding shower seat.

1107.6.1.1.1 Accessible unit facilities. All interior and exterior spaces provided as part of or serving an *Accessible dwelling unit* or *sleeping unit* shall be accessible and be located on an accessible route.

Exceptions:

1. Where multiple bathrooms are provided within an *Accessible unit*, at least one full bathroom shall be *accessible*.
2. Where multiple-family or assisted bathrooms serve an *Accessible unit*, at least 50 percent, but not less than one bathroom for each use at each cluster shall be *accessible*.
3. Five percent of all beds, but not less than one bed, shall be *accessible*.

1107.6.1.1.2 Communication features. *Accessible* communication features shall be provided in accordance with Appendix E, Section E104.2, provided, however, that at least one *Accessible unit*, but not more than 10 percent of the *Accessible units*, shall be required to provide accessible communication features.

1107.6.2 Group R-2. *Accessible units*, *Type A units* and *Type B units* shall be provided in Group R-2 occupancies in accordance with Sections 1107.6.2.1 through 1107.6.2.3.

1107.6.2.1 Live/work units. In *live/work units* constructed in accordance with Section 419, the nonresidential portion is required to be *accessible*. In a structure where there are four or more *live/work units intended to be occupied as a residence*, the residential portion of the *live/work unit* shall be a *Type B unit*.

Exception: The number of *Type B units* is permitted to be reduced in accordance with Section 1107.7.

1107.6.2.2 Apartment houses, monasteries and convents. *Type A units* and *Type B units* shall be provided in apartment houses, monasteries and convents in accordance with Sections 1107.6.2.2.1 and 1107.6.2.2.2.

1107.6.2.2.1 Type A units. In Group R-2 occupancies containing more than ten *dwelling units* or *sleeping units*, at least 15 percent of the units shall be *Type A units*, and at least 1 percent of the *Type A units*, but not less than one of the *Type A units*, shall be served by a roll-in shower that includes a permanently mounted folding shower seat. All Group R-2 units on a site shall be considered to determine the total number of units and the required number of *Type A units*. *Type A units* shall be dispersed among the various classes of units. Bedrooms in monasteries and convents shall be counted as *sleeping units*

for the purpose of determining the number of units. Where the *sleeping units* are grouped into suites, only one *sleeping unit* in each suite shall count towards the number of required *Type A units*.

Exceptions:

1. The number of *Type A units* is permitted to be reduced in accordance with Section 1107.7.
2. *Existing structures* on a *site* shall not contribute to the total number of units on a *site*.
3. *Type A units* may contain the following adaptable features:
 - 3.1 Kitchen and laundry appliances that do not have *accessible* controls.
 - 3.2 Refrigerator/freezers that do not have the required *accessible* freezer space.
 - 3.3 Kitchen sink cabinets and countertops that are not *accessible*, but that can be removed provided floor finishes extend under such cabinetry and the walls behind and surrounding cabinetry are finished.
 - 3.4 Switches & outlets located above kitchen counters that are not *accessible* but that can be modified to be *accessible*.

1107.6.2.2.2 Type B units. Where there are four or more *dwelling units* or *sleeping units* intended to be occupied as a residence in a single structure, every *dwelling unit* and *sleeping unit* intended to be occupied as a residence shall be a *Type B unit*.

Exceptions:

1. The number of *Type B units* is allowed to be reduced in accordance with Section 1107.7.
2. *Type B units* may contain the following adaptable features:
 - 2.1 Shower compartment doors that are not *accessible*, but that can be removed without damaging the shower enclosure, provided that the mounting holes can be readily made water tight and finishes extend behind the doors.

1107.6.2.3 Group R-2 other than live/work units, apartment houses, monasteries and convents. In Group R-2 occupancies, other than *live/work units*, apartment houses, monasteries and convents falling within the scope of Sections 1107.6.2.1 and 1107.6.2.2, *Accessible units* and *Type B units* shall be provided in accordance with Sections 1107.6.2.3.1 and 1107.6.2.3.2. Bedrooms within congregate living facilities shall be counted as *sleeping units* for the purpose of determining the number of units. Where the *sleeping units* are grouped into suites, only one *sleeping unit* in

each suite shall be permitted to count towards the number of required *Accessible units*.

1107.6.2.3.1 Accessible units. *Accessible dwelling units* and *sleeping units* shall be provided in accordance with Table 1107.6.1.1.

1107.6.2.3.2 Type B units. Where there are four or more *dwelling units* or *sleeping units intended to be occupied as a residence* in a single structure, every *dwelling unit* and every *sleeping unit intended to be occupied as a residence* shall be a *Type B unit*.

Exception: The number of *Type B units* is permitted to be reduced in accordance with Section 1107.7.

1107.6.3 Group R-3. In Group R-3 occupancies where there are four or more *dwelling units* or *sleeping units intended to be occupied as a residence* in a single structure, every *dwelling unit* and *sleeping unit intended to be occupied as a residence* shall be a *Type B unit*. Bedrooms within congregate living facilities shall be counted as *sleeping units* for the purpose of determining the number of units.

Exception: The number of *Type B units* is permitted to be reduced in accordance with Section 1107.7.

1107.6.4 Group R-4. *Accessible units* and *Type B units* shall be provided in Group R-4 occupancies in accordance with Sections 1107.6.4.1 and 1107.6.4.2. Bedrooms in Group R-4 facilities shall be counted as *sleeping units* for the purpose of determining the number of units.

1107.6.4.1 Accessible units. In Group R-4 Condition 1, at least one of the *sleeping units* shall be an *Accessible unit*. In Group R-4 Condition 2, at least two of the *sleeping units* shall be an *Accessible unit*.

1107.6.4.2 Type B units. In structures with four or more *sleeping units intended to be occupied as a residence*, every *sleeping unit intended to be occupied as a residence* shall be a *Type B unit*.

Exception: The number of *Type B units* is permitted to be reduced in accordance with Section 1107.7.

1107.7 General exceptions. Where specifically permitted by Section 1107.5 or 1107.6, the required number of *Type A units* and *Type B units* is permitted to be reduced in accordance with Sections 1107.7.1 through 1107.7.5.

1107.7.1 Structures without elevator service. Where no elevator service is provided in a structure, only the *dwelling units* and *sleeping units* that are located on stories indicated in Sections 1107.7.1.1 and 1107.7.1.2 are required to be *Type A units* and *Type B units*, respectively. The number of *Type A units* shall be determined in accordance with Section 1107.6.2.2.1.

1107.7.1.1 One story with Type B units required. At least one *story* containing *dwelling units* or *sleeping units intended to be occupied as a residence* shall be provided with an *accessible* entrance from the exterior of the structure and all units *intended to be occupied as a residence* on that *story* shall be *Type B units*.

1107.7.1.2 Additional stories with Type B units. On all other stories that have a building entrance in proximity to arrival points intended to serve units on that *story*, as indicated in Items 1 and 2, all *dwelling units* and *sleeping units intended to be occupied as a residence* served by that entrance on that *story* shall be *Type B units*.

1. Where the slopes of the undisturbed *site* measured between the planned entrance and all vehicular or pedestrian arrival points within 50 feet (15 240 mm) of the planned entrance are 10 percent or less, and
2. Where the slopes of the planned finished grade measured between the entrance and all vehicular or pedestrian arrival points within 50 feet (15 240 mm) of the planned entrance are 10 percent or less.

Where no such arrival points are within 50 feet (15 240 mm) of the entrance, the closest arrival point shall be used unless that arrival point serves the *story* required by Section 1107.7.1.1.

1107.7.2 Multistory units. A *multistory dwelling unit* or *sleeping unit* that is not provided with elevator service is not required to be a *Type B unit*. Where a *multistory unit* is provided with external elevator service to only one floor, the floor provided with elevator service shall be the primary entry to the unit, shall comply with the requirements for a *Type B unit* and, where provided within the unit, a living area, a kitchen and a toilet facility shall be provided on that floor.

1107.7.3 Elevator service to the lowest story with units. Where elevator service in the building provides an *accessible route* only to the lowest *story* containing *dwelling units* or *sleeping units intended to be occupied as a residence*, only the units on that *story* that are *intended to be occupied as a residence* are required to be *Type B units*.

1107.7.4 Site impracticality. On a *site* with multiple non-elevator buildings, the number of units required by Section 1107.7.1 to be *Type B units* is permitted to be reduced to a percentage that is equal to the percentage of the entire *site* having grades, prior to development, that are less than 10 percent, provided that all of the following conditions are met:

1. Not less than 20 percent of the units required by Section 1107.7.1 on the *site* are *Type B units*;
2. Units required by Section 1107.7.1, where the slope between the building entrance serving the units on that *story* and a pedestrian or vehicular arrival point is no greater than 8.33 percent, are *Type B units*;
3. Units required by Section 1107.7.1, where an elevated walkway is planned between a building entrance serving the units on that *story* and a pedestrian or vehicular arrival point and the slope between them is 10 percent or less, are *Type B units*; and
4. Units served by an elevator in accordance with Section 1107.7.3 are *Type B units*.

1107.7.5 Design flood elevation. The required number of *Type A units* and *Type B units* shall not apply to a *site* where the required elevation of the lowest floor or the lowest horizontal structural building members of nonelevator buildings are at or above the *design flood elevation* resulting in:

1. A difference in elevation between the minimum required floor elevation at the primary entrances and vehicular and pedestrian arrival points within 50 feet (15 240 mm) exceeding 30 inches (762 mm), and
2. A slope exceeding 10 percent between the minimum required floor elevation at the primary entrances and vehicular and pedestrian arrival points within 50 feet (15 240 mm).

Where no such arrival points are within 50 feet (15 240 mm) of the primary entrances, the closest arrival points shall be used.

SECTION 1108 SPECIAL OCCUPANCIES

1108.1 General. In addition to the other requirements of this chapter, the requirements of Sections 1108.2 through 1108.4 shall apply to specific occupancies.

1108.2 Assembly area seating. A building, room or space used for assembly purposes with *fixed seating* shall comply with Sections 1108.2.1 through 1108.2.5. Lawn seating shall comply with Section 1108.2.6. Assistive listening systems shall comply with Section 1108.2.7. Performance areas viewed from assembly seating areas shall comply with Section 1108.2.8. Dining areas shall comply with Section 1108.2.9.

1108.2.1 Services. If a service or facility is provided in an area that is not *accessible*, the same service or facility shall be provided on an *accessible* level and shall be *accessible*.

1108.2.2 Wheelchair spaces. In rooms and spaces used for assembly purposes with *fixed seating*, *accessible wheelchair spaces* shall be provided in accordance with Sections 1108.2.2.1 through 1108.2.2.3.

1108.2.2.1 General seating. *Wheelchair spaces* shall be provided in accordance with Table 1108.2.2.1.

**TABLE 1108.2.2.1
ACCESSIBLE WHEELCHAIR SPACES**

| CAPACITY OF SEATING IN ASSEMBLY AREAS | MINIMUM REQUIRED NUMBER OF WHEELCHAIR SPACES |
|---------------------------------------|--|
| 4 to 25 | 1 |
| 26 to 50 | 2 |
| 51 to 100 | 4 |
| 101 to 300 | 5 |
| 301 to 500 | 6 |
| 501 to 5,000 | 6, plus 1 for each 150, or fraction thereof, between 501 through 5,000 |
| 5,001 and over | 36 plus 1 for each 200, or fraction thereof, over 5,000 |

1108.2.2.2 Luxury boxes, club boxes and suites. In each luxury box, club box and suite within arenas, stadiums and *grandstands*, *wheelchair spaces* shall be provided in accordance with Table 1108.2.2.1.

1108.2.2.3 Other boxes. In boxes other than those required to comply with Section 1108.2.2.2, the total number of *wheelchair spaces* provided shall be determined in accordance with Table 1108.2.2.1. *Wheelchair spaces* shall be located in not less than 20 percent of all boxes provided.

1108.2.3 Companion seats. At least one companion seat shall be provided for each *wheelchair space* required by Sections 1108.2.2.1 through 1108.2.2.3.

1108.2.4 Dispersion of wheelchair spaces in multilevel assembly seating areas. In *multilevel assembly seating areas*, *wheelchair spaces* shall be provided on the main floor level and on one of each two additional floor or *mezzanine* levels. *Wheelchair spaces* shall be provided in each luxury box, club box and suite within assembly facilities.

Exceptions:

1. In *multilevel assembly seating areas* utilized for worship services where the second floor or *mezzanine* level contains 25 percent or less of the total seating capacity, *wheelchair spaces* shall be permitted to all be located on the main level.
2. In *multilevel assembly seating areas* where the second floor or *mezzanine* level provides 25 percent or less of the total seating capacity and 300 or fewer seats, all *wheelchair spaces* shall be permitted to be located on the main level.
3. *Wheelchair spaces* in team or player seating serving areas of sport activity are not required to be dispersed.

1108.2.5 Designated aisle seats. At least 5 percent, but not less than one, of the total number of aisle seats provided shall be designated aisle seats and shall be the aisle seats located closest to *accessible routes*.

Exception: Designated aisle seats are not required in team or player seating serving *areas of sport activity*.

1108.2.6 Lawn seating. Lawn seating areas and exterior overflow seating areas, where fixed seats are not provided, shall connect to an *accessible route*.

1108.2.7 Assistive listening systems. Each building, room or space used for assembly purposes where audible communications are integral to the use of the space shall have an assistive listening system.

Exception: Other than in courtrooms, an assistive listening system is not required where there is no audio amplification system.

1108.2.7.1 Receivers. The number and type of receivers shall be provided for assistive listening systems in accordance with Table 1108.2.7.1.

Exceptions:

1. Where a building contains more than one room or space used for assembly purposes, the

**TABLE 1108.2.7.1
RECEIVERS FOR ASSISTIVE LISTENING SYSTEMS**

| CAPACITY OF SEATING IN ASSEMBLY AREAS | MINIMUM REQUIRED NUMBER OF RECEIVERS | MINIMUM NUMBER OF RECEIVERS TO BE HEARING-AID COMPATIBLE |
|--|--|---|
| 50 or less | 2 | 2 |
| 51 to 200 | 2, plus 1 per 25 seats over 50 seats* | 2 |
| 201 to 500 | 2, plus 1 per 25 seats over 50 seats* | 1 per 4 receivers* |
| 501 to 1,000 | 20, plus 1 per 33 seats over 500 seats* | 1 per 4 receivers* |
| 1,001 to 2,000 | 35, plus 1 per 50 seats over 1,000 seats* | 1 per 4 receivers* |
| Over 2,000 | 55, plus 1 per 100 seats over 2,000 seats* | 1 per 4 receivers* |

Note: * = or fraction thereof

total number of required receivers shall be permitted to be calculated based on the total number of seats in the building, provided that all receivers are usable with all systems and if the rooms or spaces used for assembly purposes required to provide assistive listening are under one management.

- Where all seats in a building, room or space used for assembly purposes are served by an induction loop assistive listening system, the minimum number of receivers required by Table 1108.2.7.1 to be hearing-aid compatible shall not be required.

1108.2.7.2 Ticket windows. Where ticket windows are provided in stadiums and arenas, at least one window at each location shall have an assistive listening system.

1108.2.7.3 Public address systems. Where stadiums, arenas and *grandstands* have 15,000 fixed seats or more and provide audible public announcements, they shall also provide prerecorded or real-time captions of those audible public announcements.

1108.2.8 Performance areas. An *accessible route* shall directly connect the performance area to the assembly seating area where a *circulation path* directly connects a performance area to an assembly seating area. An *accessible route* shall be provided from performance areas to ancillary areas or facilities used by performers.

1108.2.9 Dining and drinking areas. In dining and drinking areas, all interior and exterior floor areas shall be *accessible* and be on an *accessible route*.

Exceptions:

- An *accessible route* between *accessible* levels and stories above or below is not required where permitted by Section 1104.4, Exception 1.
- An *accessible route* to dining and drinking areas in a *mezzanine* is not required, provided that the *mezzanine* contains less than 25 percent of the total combined area for dining and drinking and the same services, and decor are provided in the *accessible* area.
- In sports facilities, tiered dining areas providing seating required to be *accessible* shall be required to have *accessible routes* serving at least 25 per-

cent of the dining area, provided that *accessible routes* serve *accessible* seating and where each tier is provided with the same services.

- Employee-only work areas shall comply with Sections 1103.2.2 and 1104.3.1.

1108.2.9.1 Dining surfaces. Where dining surfaces for the consumption of food or drink are provided, at least 5 percent, but not less than one, of the dining surfaces for the seating and standing spaces shall be *accessible* and be distributed throughout the facility and located on a level accessed by an *accessible route*.

1108.3 Self-service storage facilities. *Self-service storage facilities* shall provide *accessible* individual self-storage spaces in accordance with Table 1108.3.

**TABLE 1108.3
ACCESSIBLE SELF-SERVICE STORAGE FACILITIES**

| TOTAL SPACES IN FACILITY | MINIMUM NUMBER OF REQUIRED ACCESSIBLE SPACES |
|-----------------------------|---|
| 1 to 200 | 5%, but not less than 1 |
| Over 200 | 10, plus 2% of total number of units over 200 |

1108.3.1 Dispersion. *Accessible* individual self-service storage spaces shall be dispersed throughout the various classes of spaces provided. Where more classes of spaces are provided than the number of required *accessible* spaces, the number of *accessible* spaces shall not be required to exceed that required by Table 1108.3. *Accessible* spaces are permitted to be dispersed in a single building of a multibuilding facility.

1108.4 Judicial facilities. Judicial facilities shall comply with Sections 1108.4.1 and 1108.4.2.

1108.4.1 Courtrooms. Each courtroom shall be *accessible* and comply with Sections 1108.4.1.1 through 1108.4.1.5.

1108.4.1.1 Jury box. A *wheelchair space* shall be provided within the jury box.

Exception: Adjacent companion seating is not required.

1108.4.1.2 Gallery seating. *Wheelchair spaces* shall be provided in accordance with Table 1108.2.2.1. Designated aisle seats shall be provided in accordance with Section 1108.2.5.

1108.4.1.3 Assistive listening systems. An assistive listening system must be provided. Receivers shall be provided for the assistive listening system in accordance with Section 1108.2.7.1.

1108.4.1.4 Employee work stations. The judge's bench, clerk's station, bailiff's station, deputy clerk's station and court reporter's station shall be located on an accessible route. The vertical access to elevated employee work stations within a courtroom is not required at the time of initial construction, provided a *ramp*, lift or elevator can be installed without requiring reconfiguration or extension of the courtroom or extension of the electrical system.

1108.4.1.5 Other work stations. The litigant's and counsel stations, including the lectern, shall be *accessible*.

1108.4.2 Holding cells. Central holding cells and court-floor holding cells shall comply with Sections 1108.4.2.1 and 1108.4.2.2.

1108.4.2.1 Central holding cells. Where separate central holding cells are provided for adult males, juvenile males, adult females or juvenile females, one of each type shall be *accessible*. Where central holding cells are provided and are not separated by age or sex, at least one *accessible* cell shall be provided.

1108.4.2.2 Court-floor holding cells. Where separate court-floor holding cells are provided for adult males, juvenile males, adult females or juvenile females, each courtroom shall be served by one *accessible* cell of each type. Where court-floor holding cells are provided and are not separated by age or sex, courtrooms shall be served by at least one *accessible* cell. *Accessible* cells shall be permitted to serve more than one courtroom.

1108.5 Detention and correctional facilities. Detention and correctional facilities shall comply with Sections 1108.5.1 through 1108.5.5.2.

1108.5.1 General. Buildings, facilities or portions thereof, in which people are detained for penal or correctional purposes, or in which the liberty of the inmates is restricted for security reasons, shall comply with Section 1108.5.

1108.5.2 General holding cells and general housing cells. General holding cells and general housing cells shall be provided in accordance with Section 1108.5.2.

Exception: Alterations to cells shall not be required to comply with this section except to the extent determined by the Attorney General of the District of Columbia.

1108.5.2.1 Cells. *Accessible cells* shall be provided in accordance with Section 1107.5.5.1.

1108.5.2.2 Beds. In cells having more than 25 beds, 5 percent of the beds shall have clear floor space complying with ICC A117.1, Section 806.2.

1108.5.2.3 Communication features. At least 2 percent, but not less than one general holding cell and general housing cell shall be equipped with audible emergency alarm systems and permanently installed

telephones within the cell, shall comply with ICC A117.1, Section 806.3.

1108.5.2.4 Overlap. Cells complying with ICC A117.1, Section 806.2 shall not be used to satisfy the minimum number of cells required to comply with ICC A117.1, Section 806.3.

1108.5.3 Special holding cells and special housing cells or rooms. *Accessible* special holding cells or special housing cells or rooms shall be provided in accordance with Section 1107.5.5.2.

1108.5.4 Medical care facilities. *Accessible* patient sleeping units or cells in medical care facilities shall be provided in accordance with Section 1107.5.5.3.

1108.5.5 Visiting areas. Visiting areas shall comply with Section 1108.5.5.

1108.5.5.1 Cubicles and counters. At least 5 percent, but not less than one cubicle, shall be *accessible* on both the visitor and detainee sides. Where counters are provided, at least one shall be *accessible* on both the visitor and detainee or inmate sides.

Exception: This requirement shall not apply to the inmate or detainee side of cubicles or counters at noncontact visiting areas not serving holding or housing cells to comply with Section 1108.5.

1108.5.5.2 Partitions. Where solid partitions or security glazing separates visitors from detainees, at least one of each type of cubicle or counter partition shall be *accessible*.

SECTION 1109 OTHER FEATURES AND FACILITIES

1109.1 General. *Accessible* building features and facilities shall be provided in accordance with Sections 1109.2 through 1109.15.

Exception: *Accessible units, Type A units and Type B units* shall comply with Chapter 10 of ICC A117.1.

1109.2 Toilet and bathing facilities. Each toilet room and bathing room shall be *accessible*. Where a floor level is not required to be connected by an *accessible route*, the only toilet rooms or bathing rooms provided within the facility shall not be located on the inaccessible floor. Except as provided for in Sections 1109.2.2 and 1109.2.3, at least one of each type of fixture, element, control or dispenser in each accessible toilet room and bathing room shall be *accessible*.

Exceptions:

1. Toilet rooms or bathing rooms accessed only through a private office, not for *common* or *public use* and intended for use by a single occupant, shall be permitted to comply with the specific exceptions in ICC A117.1.
2. This section is not applicable to toilet and bathing rooms that serve *dwelling units* or *sleeping units* that are not required to be *accessible* by Section 1107.

3. Where multiple single-user toilet rooms or bathing rooms are clustered at a single location, at least 50 percent but not less than one room for each use at each cluster shall be *accessible*.
4. Where no more than one urinal is provided in a toilet room or bathing room, the urinal is not required to be *accessible*.
5. Toilet rooms or bathing rooms that are part of critical care or intensive care patient sleeping rooms serving *Accessible units* are not required to be *accessible*.
6. Toilet rooms or bathing rooms designed for bariatrics patients are not required to comply with the toilet room and bathing room requirement in ICC A117.1. The *sleeping units* served by bariatrics toilet or bathing rooms shall not count toward the required number of *Accessible sleeping units*.
7. Where toilet facilities are primarily for children's use, required *accessible* water closets, toilet compartments and lavatories shall be permitted to comply with children's provision of ICC A117.1.

1109.2.1 Family or assisted-use toilet and bathing rooms. In assembly and mercantile occupancies, an *accessible* family or assisted-use toilet room shall be provided where an aggregate of six or more male and female water closets is required. In buildings of mixed occupancy, only those water closets required for the assembly or mercantile occupancy shall be used to determine the family or assisted-use toilet room requirement. In recreational facilities where separate-sex bathing rooms are provided, an *accessible* family or assisted-use bathing room shall be provided. Fixtures located within family or assisted-use toilet and bathing rooms shall be included in determining the number of fixtures provided in an occupancy.

Exception: Where each separate-sex bathing room has only one shower or bathtub fixture, a family or assisted-use bathing room is not required.

1109.2.1.1 Standard. Family or assisted-use toilet and bathing rooms shall comply with Sections 1109.2.1.2 through 1109.2.1.7.

1109.2.1.2 Family or assisted-use toilet rooms. Family or assisted-use toilet rooms shall include only one water closet and only one lavatory. A family or assisted-use bathing room in accordance with Section 1109.2.1.3 shall be considered a family or assisted-use toilet room.

Exception: A urinal is permitted to be provided in addition to the water closet in a family or assisted-use toilet room.

1109.2.1.3 Family or assisted-use bathing rooms. Family or assisted-use bathing rooms shall include only one shower or bathtub fixture. Family or assisted-use bathing rooms shall also include one water closet and one lavatory. Where storage facilities are provided for separate-sex bathing rooms, *accessible* storage facilities

shall be provided for family or assisted-use bathing rooms.

1109.2.1.4 Location. Family or assisted-use toilet and bathing rooms shall be located on an *accessible route*. Family or assisted-use toilet rooms shall be located not more than one *story* above or below separate-sex toilet rooms. The *accessible route* from any separate-sex toilet room to a family or assisted-use toilet room shall not exceed 500 feet (152 m).

1109.2.1.5 Prohibited location. In passenger transportation facilities and airports, the *accessible route* from separate-sex toilet rooms to a family or assisted-use toilet room shall not pass through security checkpoints.

1109.2.1.6 Clear floor space. Where doors swing into a family or assisted-use toilet or bathing room, a clear floor space not less than 30 inches by 48 inches (762 mm by 1219 mm) shall be provided, within the room, beyond the area of the door swing.

1109.2.1.7 Privacy. Doors to family or assisted-use toilet and bathing rooms shall be securable from within the room.

1109.2.2 Water closet compartment. Where water closet compartments are provided in a toilet room or bathing room, at least 5 percent of the total number of compartments shall be wheelchair *accessible*. Where the combined total water closet compartments and urinals provided in a toilet room or bathing room is six or more, at least 5 percent of the total number of compartments shall be ambulatory *accessible*, provided in addition to the wheelchair *accessible* compartment.

1109.2.3 Lavatories. Where lavatories are provided, at least 5 percent, but not less than one, shall be *accessible*. Where an *accessible* lavatory is located within the *accessible* water closet compartment at least one additional *accessible* lavatory shall be provided in the multicompartiment toilet room outside the water closet compartment. Where the total lavatories provided in a toilet room or bathing facility is six or more, at least one lavatory with enhanced reach ranges shall be provided.

1109.3 Sinks. Where sinks are provided, at least 5 percent but not less than one provided in *accessible* spaces shall be *accessible*.

Exception: Mop or service sinks are not required to be *accessible*.

1109.4 Kitchens and kitchenettes. Where kitchens and kitchenettes are provided in *accessible* spaces or rooms, they shall be *accessible*.

1109.5 Drinking fountains. Where drinking fountains are provided on an exterior site, on a floor or within a secured area, the drinking fountains shall be provided in accordance with Sections 1109.5.1 and 1109.5.2.

1109.5.1 Minimum number. No fewer than two drinking fountains shall be provided. One drinking fountain shall comply with the requirements for people who use a wheel-

chair and one drinking fountain shall comply with the requirements for standing persons.

Exceptions:

1. A single drinking fountain with two separate spouts that complies with the requirements for people who use a wheelchair and standing persons shall be permitted to be substituted for two separate drinking fountains.
2. Where drinking fountains are primarily for children's use, drinking fountains for people using wheelchairs shall be permitted to comply with the children's provisions in ICC A117.1 and drinking fountains for standing children shall be permitted to provide the spout at 30 inches (762 mm) minimum above the floor.

1109.5.2 More than the minimum number. Where more than the minimum number of drinking fountains specified in Section 1109.5.1 is provided, 50 percent of the total number of drinking fountains provided shall comply with the requirements for persons who use a wheelchair and 50 percent of the total number of drinking fountains provided shall comply with the requirements for standing persons.

Exceptions:

1. Where 50 percent of the drinking fountains yields a fraction, 50 percent shall be permitted to be rounded up or down, provided that the total number of drinking fountains complying with this section equals 100 percent of the drinking fountains.
2. Where drinking fountains are primarily for children's use, drinking fountains for people using wheelchairs shall be permitted to comply with the children's provisions in ICC A117.1 and drinking fountains for standing children shall be permitted to provide the spout at 30 inches (762 mm) minimum above the floor.

1109.6 Saunas and steam rooms. Where provided, saunas and steam rooms shall be *accessible*.

Exception: Where saunas or steam rooms are clustered at a single location, at least 5 percent of the saunas and steam rooms, but not less than one, of each type in each cluster shall be *accessible*.

1109.7 Elevators. Passenger elevators on an *accessible route* shall be *accessible* and comply with Chapter 30.

1109.8 Lifts. Platform (wheelchair) lifts are permitted to be a part of a required *accessible route* in new construction where indicated in Items 1 through 10. Platform (wheelchair) lifts shall be installed in accordance with ASME A18.1.

1. An *accessible route* to a performing area and speaker platforms.
2. An *accessible route* to *wheelchair spaces* required to comply with the *wheelchair space* dispersion requirements of Sections 1108.2.2 through 1108.2.6.

3. An *accessible route* to spaces that are not open to the general public with an *occupant load* of not more than five.
4. An *accessible route* within an individual *dwelling unit* or *sleeping unit* required to be an *Accessible unit*, *Type A unit* or *Type B unit*.
5. An *accessible route* to jury boxes and witness stands; raised courtroom stations including judges' benches, clerks' stations, bailiffs' stations, deputy clerks' stations and court reporters' stations; and to depressed areas such as the well of the court.
6. An *accessible route* to load and unload areas serving amusement rides.
7. An *accessible route* to play components or soft contained play structures.
8. An *accessible route* to team or player seating areas serving *areas of sport activity*.
9. An *accessible route* instead of gangways serving recreational boating facilities and fishing piers and platforms.
10. An *accessible route* where existing exterior *site* constraints make use of a *ramp* or elevator infeasible.

1109.9 Storage. Where fixed or built-in storage elements such as cabinets, coat hooks, shelves, medicine cabinets, lockers, closets and drawers are provided in required *accessible* spaces, at least 5 percent, but not less than one of each type shall be *accessible*.

1109.9.1 Equity. *Accessible* facilities and spaces shall be provided with the same storage elements as provided in the similar nonaccessible facilities and spaces.

1109.9.2 Shelving and display units. Self-service shelves and display units shall be located on an *accessible route*. Such shelving and display units shall not be required to comply with reach-range provisions.

1109.10 Detectable warnings. Passenger transit platform edges bordering a drop-off and not protected by platform screens or *guards* shall have a *detectable warning*.

Exception: *Detectable warnings* are not required at bus stops.

1109.11 Seating at tables, counters and work surfaces. Where seating or standing space at fixed or built-in tables, counters or work surfaces is provided in *accessible* spaces, at least 5 percent of the seating and standing spaces, but not less than one, shall be *accessible*.

Exception: Check-writing surfaces at check-out aisles not required to comply with Section 1109.12.2 are not required to be *accessible*.

1109.11.1 Dispersion. *Accessible* fixed or built-in seating at tables, counters or work surfaces shall be distributed throughout the space or facility containing such elements and located on a level accessed by an *accessible route*.

1109.11.2 Visiting areas. Visiting areas in judicial facilities and Group I-3 shall comply with Sections 1109.11.2.1 and 1109.11.2.2.

1109.11.2.1 Cubicles and counters. At least 5 percent, but not less than one of the cubicles, shall be *accessible* on both the visitor and detainee sides. Where counters are provided, at least one shall be *accessible* on both the visitor and detainee sides.

Exception: This requirement shall not apply to the detainee side of cubicles or counters at noncontact visiting areas not serving *Accessible unit* holding cells.

1109.11.2.2 Partitions. Where solid partitions or security glazing separate visitors from detainees, at least one of each type of cubicle or counter partition shall be *accessible*.

1109.12 Service facilities. Service facilities shall provide for *accessible* features in accordance with Sections 1109.12.1 through 1109.12.5.

1109.12.1 Dressing, fitting and locker rooms. Where dressing rooms, fitting rooms or locker rooms are provided, at least 5 percent, but not less than one, of each type of use in each cluster provided shall be *accessible*.

1109.12.2 Check-out aisles. Where check-out aisles are provided, *accessible* check-out aisles shall be provided in accordance with Table 1109.12.2. Where check-out aisles serve different functions, accessible check-out aisles shall be provided in accordance with Table 1109.12.2 for each function. Where check-out aisles are dispersed throughout the building or facility, *accessible* check-out aisles shall also be dispersed. Traffic control devices, security devices and turnstiles located in *accessible* check-out aisles or lanes shall be *accessible*.

Exception: Where the public use area is under 5,000 square feet (465 m²) not more than one *accessible* check-out aisle shall be required.

**TABLE 1109.12.2
ACCESSIBLE CHECK-OUT AISLES**

| TOTAL CHECK-OUT AISLES OF EACH FUNCTION | MINIMUM NUMBER OF ACCESSIBLE CHECK-OUT AISLES OF EACH FUNCTION |
|---|--|
| 1 to 4 | 1 |
| 5 to 8 | 2 |
| 9 to 15 | 3 |
| Over 15 | 3, plus 20% of additional aisles |

1109.12.3 Point of sale and service counters. Where counters are provided for sales or distribution of goods or services, at least one of each type provided shall be *accessible*. Where such counters are dispersed throughout the building or facility, *accessible* counters shall also be dispersed.

1109.12.4 Food service lines. Food service lines shall be *accessible*. Where self-service shelves are provided, at least 50 percent, but not less than one, of each type provided shall be *accessible*.

1109.12.5 Queue and waiting lines. Queue and waiting lines servicing *accessible* counters or check-out aisles shall be *accessible*.

1109.13 Controls, operating mechanisms and hardware. Controls, operating mechanisms and hardware intended for operation by the occupant, including switches that control lighting and ventilation and electrical convenience outlets, in *accessible* spaces, along *accessible routes* or as parts of *accessible* elements shall be *accessible*.

Exceptions:

1. Operable parts that are intended for use only by service or maintenance personnel shall not be required to be *accessible*.
2. Electrical or communication receptacles serving a dedicated use shall not be required to be *accessible*.
3. Where two or more outlets are provided in a kitchen above a length of counter top that is uninterrupted by a sink or appliance, one outlet shall not be required to be *accessible*.
4. Floor electrical receptacles shall not be required to be *accessible*.
5. HVAC diffusers shall not be required to be *accessible*.
6. Except for light switches, where redundant controls are provided for a single element, one control in each space shall not be required to be *accessible*.
7. Access doors or gates in barrier walls and fences protecting pools, spas and hot tubs shall be permitted to comply with Section 1010.1.9.2.

1109.14 Fuel-dispensing systems. Fuel-dispensing systems shall be *accessible*.

1109.15 Gaming machines and gaming tables. Two percent, but not less than one, of each type of gaming table provided shall be *accessible* and provided with a front approach. Two percent of gaming machines provided shall be *accessible* and provided with a front approach. *Accessible* gaming machines shall be distributed throughout the different types of gaming machines provided.

SECTION 1110 RECREATIONAL FACILITIES

1110.1 General. Recreational facilities shall be provided with *accessible* features in accordance with Sections 1110.2 through 1110.4.

1110.2 Facilities serving Group R-2, R-3 and R-4 occupancies. Recreational facilities that serve Group R-2, R-3 and Group R-4 occupancies shall comply with Sections 1110.2.1 through 1110.2.3, as applicable.

1110.2.1 Facilities serving Accessible units. In Group R-2 and R-4 occupancies where recreational facilities serve *Accessible units*, every recreational facility of each type serving *Accessible units* shall be *accessible*.

1110.2.2 Facilities serving Type A and Type B units in a single building. In Group R-2, R-3 and R-4 occupancies where recreational facilities serve a single building containing *Type A units* or *Type B units*, 25 percent, but not less than one, of each type of recreational facility shall be

accessible. Every recreational facility of each type on a site shall be considered to determine the total number of each type that is required to be *accessible*.

1110.2.3 Facilities serving Type A and Type B units in multiple buildings. In Group R-2, R-3 and R-4 occupancies on a single site where multiple buildings containing *Type A units* or *Type B units* are served by recreational facilities, 25 percent, but not less than one, of each type of recreational facility serving each building shall be *accessible*. The total number of each type of recreational facility that is required to be *accessible* shall be determined by considering every recreational facility of each type serving each building on the site.

1110.3 Other occupancies. Recreational facilities not falling within the purview of Section 1110.2 shall be *accessible*.

1110.4 Recreational facilities. Recreational facilities shall be *accessible* and shall be on an *accessible route* to the extent specified in this section.

1110.4.1 Area of sport activity. Each *area of sport activity* shall be on an *accessible route* and shall not be required to be *accessible* except as provided for in Sections 1110.4.2 through 1110.4.14.

1110.4.2 Team or player seating. At least one wheelchair space shall be provided in team or player seating areas serving *areas of sport activity*.

Exception: Wheelchair spaces shall not be required in team or player seating areas serving bowling lanes that are not required to be *accessible* in accordance with Section 1110.4.3.

1110.4.3 Bowling lanes. An *accessible route* shall be provided to at least 5 percent, but not less than one, of each type of bowling lane.

1110.4.4 Court sports. In court sports, at least one *accessible route* shall directly connect both sides of the court.

1110.4.5 Raised boxing or wrestling rings. Raised boxing or wrestling rings are not required to be *accessible* or to be on an *accessible route*.

1110.4.6 Raised refereeing, judging and scoring areas. Raised structures used solely for refereeing, judging or scoring a sport are not required to be *accessible* or to be on an *accessible route*.

1110.4.7 Animal containment areas. Animal containment areas that are not within public use areas are not required to be *accessible* or to be on an *accessible route*.

1110.4.8 Amusement rides. Amusement rides that move persons through a fixed course within a defined area shall comply with Sections 1110.4.8.1 through 1110.4.8.3.

Exception: Mobile or portable amusement rides shall not be required to be *accessible*.

1110.4.8.1 Load and unload areas. Load and unload areas serving amusement rides shall be *accessible* and be on an *accessible route*. Where load and unload areas have more than one loading or unloading position, at least one loading and unloading position shall be on an *accessible route*.

1110.4.8.2 Wheelchair spaces, ride seats designed for transfer and transfer devices. Where amusement rides are in the load and unload position, the following shall be on an *accessible route*.

1. The position serving a wheelchair space.
2. Amusement ride seats designed for transfer.
3. Transfer devices.

1110.4.8.3 Minimum number. Amusement rides shall provide at least one wheelchair space, amusement ride seat designed for transfer or transfer device.

Exceptions:

1. Amusement rides that are controlled or operated by the rider are not required to comply with this section.
2. Amusement rides designed primarily for children, where children are assisted on and off the ride by an adult, are not required to comply with this section.
3. Amusement rides that do not provide seats that are built-in or mechanically fastened shall not be required to comply with this section.

1110.4.9 Recreational boating facilities. Boat slips required to be *accessible* by Sections 1110.4.9.1 and 1110.4.9.2 and boarding piers at boat launch ramps required to be *accessible* by Section 1110.4.9.3 shall be on an *accessible route*.

1110.4.9.1 Boat slips. *Accessible* boat slips shall be provided in accordance with Table 1110.4.9.1. All units on the site shall be combined to determine the number of *accessible* boat slips required. Where the number of boat slips is not identified, each 40 feet (12 m) of boat slip edge provided along the perimeter of the pier shall be counted as one boat slip for the purpose of this section.

Exception: Boat slips not designed for embarking or disembarking are not required to be *accessible* or be on an *accessible route*.

1110.4.9.2 Dispersion. *Accessible* boat slips shall be dispersed throughout the various types of boat slips provided. Where the minimum number of *accessible* boat slips has been met, no further dispersion shall be required.

1110.4.9.3 Boarding piers at boat launch ramps. Where boarding piers are provided at boat launch ramps, at least 5 percent, but not less than one, of the boarding piers shall be *accessible*.

1110.4.10 Exercise machines and equipment. At least one of each type of exercise machine and equipment shall be on an *accessible route*.

1110.4.11 Fishing piers and platforms. Fishing piers and platforms shall be *accessible* and be on an *accessible route*.

1110.4.12 Miniature golf facilities. Miniature golf facilities shall comply with Sections 1110.4.12.1 through 1110.4.12.3.

**TABLE 1110.4.9.1
BOAT SLIPS**

| TOTAL NUMBER OF BOAT SLIPS PROVIDED | MINIMUM NUMBER OF REQUIRED ACCESSIBLE BOAT SLIPS |
|-------------------------------------|---|
| 1 to 25 | 1 |
| 26 to 50 | 2 |
| 51 to 100 | 3 |
| 101 to 150 | 4 |
| 151 to 300 | 5 |
| 301 to 400 | 6 |
| 401 to 500 | 7 |
| 501 to 600 | 8 |
| 601 to 700 | 9 |
| 701 to 800 | 10 |
| 801 to 900 | 11 |
| 901 to 1000 | 12 |
| 1001 and over | 12, plus 1 for every 100, or fraction thereof, over 1,000 |

1110.4.12.1 Minimum number. At least 50 percent of holes on miniature golf courses shall be *accessible*.

1110.4.12.2 Miniature golf course configuration. Miniature golf courses shall be configured so that the *accessible* holes are consecutive. Miniature golf courses shall provide an *accessible route* from the last *accessible* hole to the course entrance or exit without requiring travel through any other holes on the course.

Exception: One break in the sequence of consecutive holes shall be permitted provided that the last hole on the miniature golf course is the last hole in the sequence.

1110.4.12.3 Accessible route. Holes required to comply with Section 1110.4.12.1, including the start of play, shall be on an *accessible route*.

1110.4.13 Swimming pools, wading pools, hot tubs and spas. Swimming pools, wading pools, hot tubs and spas shall be *accessible* and be on an *accessible route*.

Exceptions:

1. Catch pools or a designated section of a pool used as a terminus for a water slide flume shall not be required to provide an *accessible* means of entry, provided that a portion of the catch pool edge is on an *accessible route*.
2. Where spas or hot tubs are provided in a cluster, at least 5 percent, but not less than one spa or hot tub in each cluster, shall be *accessible* and be on an *accessible route*.
3. Swimming pools, wading pools, spas and hot tubs that are required to be *accessible* by Sections 1110.2.2 and 1110.2.3 are not required to provide *accessible* means of entry into the water.

1110.4.13.1 Raised diving boards and diving platforms. Raised diving boards and diving platforms are

not required to be *accessible* or to be on an *accessible route*.

1110.4.13.2 Water slides. Water slides are not required to be *accessible* or to be on an *accessible route*.

1110.4.14 Shooting facilities with firing positions. Where shooting facilities with firing positions are designed and constructed at a site, at least 5 percent, but not less than one, of each type of firing position shall be *accessible* and be on an *accessible route*.

SECTION 1111 SIGNAGE

1111.1 Signs. Required *accessible* elements shall be identified by the International Symbol of Accessibility at the following locations.

1. *Accessible* parking spaces required by Section 1106.1.

Exception: Where the total number of parking spaces provided is four or less, identification of *accessible* parking spaces is not required.

2. *Accessible* parking spaces required by Section 1106.2.

Exception: In Group I-1, R-2, R-3 and R-4 facilities, where parking spaces are assigned to specific *dwelling units* or *sleeping units*, identification of *accessible* parking spaces is not required.

3. *Accessible* passenger loading zones.
4. *Accessible* rooms where multiple single-user toilet or bathing rooms are clustered at a single location.
5. *Accessible* entrances where not all entrances are *accessible*.
6. *Accessible* check-out aisles where not all aisles are *accessible*. The sign, where provided, shall be above the check-out aisle in the same location as the check-out aisle number or type of check-out identification.

7. Family or assisted-use toilet and bathing rooms.
8. *Accessible* dressing, fitting and locker rooms where not all such rooms are *accessible*.
9. *Accessible* areas of refuge in accordance with Section 1009.9.
10. Exterior areas for assisted rescue in accordance with Section 1009.9.
11. In recreational facilities, lockers that are required to be *accessible* in accordance with Section 1109.9.

1111.2 Directional signage. Directional signage indicating the route to the nearest like *accessible* element shall be provided at the following locations. These directional signs shall include the International Symbol of Accessibility and sign characters shall meet the visual character requirements in accordance with ICC A117.1.

1. Inaccessible building entrances.
2. Inaccessible public toilets and bathing facilities.
3. Elevators not serving an *accessible route*.
4. At each separate-sex toilet and bathing room indicating the location of the nearest family/assisted use toilet or bathing room where provided in accordance with Section 1109.2.1.
5. At *exits* and *exit stairways* serving a required *accessible* space, but not providing an *approved accessible means of egress*, signage shall be provided in accordance with Section 1009.10.
6. Where drinking fountains for persons using wheelchairs and drinking fountains for standing persons are not located adjacent to each other, directional signage shall be provided indicating the location of the other drinking fountains.

1111.3 Other signs. Signage indicating special accessibility provisions shall be provided as shown.

1. Each assembly area required to comply with Section 1108.2.7 shall provide a sign notifying patrons of the availability of assistive listening systems. The sign shall comply with ICC A117.1 requirements for visual characters and include the International Symbol of Access for Hearing Loss.

Exception: Where ticket offices or windows are provided, signs are not required at each assembly area provided that signs are displayed at each ticket office or window informing patrons of the availability of assistive listening systems.

2. At each door to an *area of refuge*, an exterior area for assisted rescue, an *egress stairway*, *exit passageway* and *exit discharge*, signage shall be provided in accordance with Section 1013.4.
3. At *areas of refuge*, signage shall be provided in accordance with Section 1009.11.
4. At exterior areas for assisted rescue, signage shall be provided in accordance with Section 1009.11.

5. At two-way communication systems, signage shall be provided in accordance with Section 1009.8.2.
6. In *interior exit stairways* and *ramps*, floor level signage shall be provided in accordance with Section 1023.9.
7. Signs identifying the type of access provided on amusement rides required to be *accessible* by Section 1110.4.8 shall be provided at entries to queues and waiting lines. In addition, where *accessible* unload areas also serve as *accessible* load areas, signs indicating the location of the *accessible* load and unload areas shall be provided at entries to queues and waiting lines. These directional sign characters shall meet the visual character requirements in accordance with ICC A117.1.

1111.4 Variable message signs. Where provided in the locations in Sections 1111.4.1 and 1111.4.2, variable message signs shall comply with the variable message sign requirements of ICC A117.1.

1111.4.1 Transportation facilities. Where provided in transportation facilities, variable message signs conveying transportation-related information shall comply with Section 1111.4.

1111.4.2 Emergency shelters. Where provided in buildings that are designated as emergency shelters, variable message signs conveying emergency-related information shall comply with Section 1111.4.

Exception: Where equivalent information is provided in an audible manner, variable message signs are not required to comply with ICC A117.1.

CHAPTER 12

INTERIOR ENVIRONMENT

SECTION 1201 GENERAL

1201.1 Scope. The provisions of this chapter shall govern ventilation, temperature control, lighting, *yards* and *courts*, sound transmission, room dimensions, surrounding materials and rodentproofing associated with the interior spaces of buildings.

SECTION 1202 DEFINITIONS

1202.1 General. The following terms are defined in Chapter 2: **SUNROOM.**

THERMAL ISOLATION.

SECTION 1203 VENTILATION

1203.1 General. Buildings shall be provided with natural ventilation in accordance with Section 1203.4, or mechanical ventilation in accordance with the *Mechanical Code*. Each new *dwelling unit* shall be ventilated by mechanical means in accordance with Section 403 of the *Mechanical Code* and shall have at least one opening to the outdoors for natural ventilation of not less than 4 percent of the floor area of the habitable spaces of the *dwelling unit*. *Ambulatory care facilities* and Group I-2 occupancies shall be ventilated by mechanical means in accordance with Section 407 of the *Mechanical Code*.

1203.2 Ventilation required. Enclosed *attics* and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof framing members shall have cross ventilation for each separate space by ventilation openings protected against the entrance of rain and snow. Blocking and bridging shall be arranged so as not to interfere with the movement of air. An airspace of not less than 1 inch (25 mm) shall be provided between the insulation and the roof sheathing. The net free ventilating area shall be not less than $\frac{1}{150}$ of the area of the space ventilated. Ventilators shall be installed in accordance with manufacturer's installation instructions.

Exception: The net free cross-ventilation area shall be permitted to be reduced to $\frac{1}{300}$ provided both of the following conditions are met:

1. In Climate Zones 6, 7 and 8, a Class I or II vapor retarder is installed on the warm-in-winter side of the ceiling.
2. At least 40 percent and not more than 50 percent of the required venting area is provided by ventilators located in the upper portion of the *attic* or rafter space. Upper ventilators shall be located not more

than 3 feet (914 mm) below the ridge or highest point of the space, measured vertically, with the balance of the *ventilation* provided by eave or cornice vents. Where the location of wall or roof framing members conflicts with the installation of upper ventilators, installation more than 3 feet (914 mm) below the ridge or highest point of the space shall be permitted.

1203.2.1 Openings into attic. Exterior openings into the *attic* space of any building intended for human occupancy shall be protected to prevent the entry of birds, squirrels, rodents, snakes and other similar creatures. Openings for ventilation having a least dimension of not less than $\frac{1}{16}$ inch (1.6 mm) and not more than $\frac{1}{4}$ inch (6.4 mm) shall be permitted. Openings for ventilation having a least dimension larger than $\frac{1}{4}$ inch (6.4 mm) shall be provided with corrosion-resistant wire cloth screening, hardware cloth, perforated vinyl or similar material with openings having a least dimension of not less than $\frac{1}{16}$ inch (1.6 mm) and not more than $\frac{1}{4}$ inch (6.4 mm). Where combustion air is obtained from an *attic* area, it shall be in accordance with Chapter 7 of the *Mechanical Code*.

1203.3 Unvented attic and unvented enclosed rafter assemblies. Unvented *attics* and unvented enclosed roof framing assemblies created by ceilings applied directly to the underside of the roof framing members/rafters and the structural roof sheathing at the top of the roof framing members shall be permitted where all the following conditions are met:

1. The unvented *attic* space is completely within the *building thermal envelope*.
2. No interior Class I vapor retarders are installed on the ceiling side (*attic* floor) of the unvented *attic* assembly or on the ceiling side of the unvented enclosed roof framing assembly.
3. Where wood shingles or shakes are used, a minimum $\frac{1}{4}$ -inch (6.4 mm) vented airspace separates the shingles or shakes and the roofing underlayment above the structural sheathing.
4. In Climate Zones 5, 6, 7 and 8, any air-impermeable insulation shall be a Class II vapor retarder or shall have a Class II vapor retarder coating or covering in direct contact with the underside of the insulation.
5. Insulation shall be located in accordance with the following:
 - 5.1. Item 5.1.1, 5.1.2, 5.1.3 or 5.1.4 shall be met, depending on the air permeability of the insulation directly under the structural roof sheathing.
 - 5.1.1. Where only air-impermeable insulation is provided, it shall be applied

in direct contact with the underside of the structural roof sheathing.

5.1.2. Where air-permeable insulation is provided inside the building thermal envelope, it shall be installed in accordance with Item 5.1. In addition to the air-permeable insulation installed directly below the structural sheathing, rigid board or sheet insulation shall be installed directly above the structural roof sheathing in accordance with the R values in Table 1203.3 for condensation control.

5.1.3. Where both air-impermeable and air-permeable insulation are provided, the *air-impermeable insulation* shall be applied in direct contact with the underside of the structural roof sheathing in accordance with Item 5.1.1 and shall be in accordance with the R values in Table 1203.3 for condensation control. The *air-permeable insulation* shall be installed directly under the *air-impermeable insulation*.

5.1.4. Alternatively, sufficient rigid board or sheet insulation shall be installed directly above the structural roof sheathing to maintain the monthly average temperature of the underside of the structural roof sheathing above 45°F (7°C). For calculation purposes, an interior air temperature of 68°F (20°C) is assumed and the exterior air temperature is assumed to be the monthly average outside air temperature of the three coldest months.

5.2. Where preformed insulation board is used as the *air-impermeable insulation* layer, it shall be

sealed at the perimeter of each individual sheet interior surface to form a continuous layer.

Exceptions:

1. Section 1203.3 does not apply to special use structures or enclosures such as swimming pool enclosures, data processing centers, hospitals or art galleries.
2. Section 1203.3 does not apply to enclosures in Climate Zones 5 through 8 that are humidified beyond 35 percent during the three coldest months.

1203.4 Under-floor ventilation. The space between the bottom of the floor joists and the earth under any building except spaces occupied by basements or cellars shall be provided with ventilation openings through foundation walls or *exterior walls*. Such openings shall be placed so as to provide cross ventilation of the under-floor space.

1203.4.1 Openings for under-floor ventilation. The net area of ventilation openings shall be not less than 1 square foot for each 150 square feet (0.67 m² for each 100 m²) of crawl-space area. Ventilation openings shall be covered for their height and width with any of the following materials, provided that the least dimension of the covering shall be not greater than 1/4 inch (6.4 mm):

1. Perforated sheet metal plates not less than 0.070 inch (1.8 mm) thick.
2. Expanded sheet metal plates not less than 0.047 inch (1.2 mm) thick.
3. Cast-iron grilles or gratings.
4. Extruded load-bearing vents.
5. Hardware cloth of 0.035-inch (0.89 mm) wire or heavier.
6. Corrosion-resistant wire mesh, with the least dimension not greater than 1/8 inch (3.2 mm).

1203.4.2 Exceptions. The following are exceptions to Sections 1203.4 and 1203.4.1:

1. Where warranted by climatic conditions, ventilation openings to the outdoors are not required if ventilation openings to the interior are provided.

**TABLE 1203.3
INSULATION FOR CONDENSATION CONTROL**

| CLIMATE ZONE | MINIMUM R-VALUE OF AIR-IMPERMEABLE INSULATION ^a |
|--------------------------|--|
| 2B and 3B tile roof only | 0 (none required) |
| 1, 2A, 2B, 3A, 3B, 3C | R-5 |
| 4C | R-10 |
| 4A, 4B | R-15 |
| 5 | R-20 |
| 6 | R-25 |
| 7 | R-30 |
| 8 | R-35 |

a. Contributes to, but does not supersede, thermal resistance requirements for attic and roof assemblies in Section C402.2.1 of the *Energy Conservation Code*.

2. The total area of ventilation openings is permitted to be reduced to $\frac{1}{1,500}$ of the under-floor area where the ground surface is covered with a Class I vapor retarder material and the required openings are placed so as to provide cross ventilation of the space. The installation of operable louvers shall not be prohibited.
3. Ventilation openings are not required where continuously operated mechanical ventilation is provided at a rate of 1.0 cubic foot per minute (cfm) for each 50 square feet (1.02 L/s for each 10 m²) of crawl-space floor area and the ground surface is covered with a Class I vapor retarder.
4. Ventilation openings are not required where the ground surface is covered with a Class I vapor retarder, the perimeter walls are insulated and the space is conditioned in accordance with the *Energy Conservation Code*.
5. For buildings in flood hazard areas as established in Section 1612.3, the openings for under-floor ventilation shall be deemed as meeting the flood opening requirements of ASCE 24 provided that the ventilation openings are designed and installed in accordance with ASCE 24.

1203.5 Natural ventilation. Natural *ventilation* of an occupied space shall be through windows, doors, louvers or other openings to the outdoors. The operating mechanism for such openings shall be provided with ready access so that the openings are readily controllable by the building occupants.

1203.5.1 Ventilation area required. The openable area of the openings to the outdoors shall be not less than 4 percent of the floor area being ventilated.

1203.5.1.1 Adjoining spaces. Where rooms and spaces without openings to the outdoors are ventilated through an adjoining room, the opening to the adjoining room shall be unobstructed and shall have an area of not less than 8 percent of the floor area of the interior room or space, but not less than 25 square feet (2.3 m²). The openable area of the openings to the outdoors shall be based on the total floor area being ventilated.

Exception: Exterior openings required for *ventilation* shall be permitted to open into a sunroom with *thermal isolation* or a patio cover provided that the openable area between the sunroom addition or patio cover and the interior room shall have an area of not less than 8 percent of the floor area of the interior room or space, but not less than 20 square feet (1.86 m²). The openable area of the openings to the outdoors shall be based on the total floor area being ventilated.

1203.5.1.2 Openings below grade. Where openings below grade provide required natural *ventilation*, the outside horizontal clear space measured perpendicular to the opening shall be one and one-half times the depth of the opening. The depth of the opening shall be mea-

sured from the average adjoining ground level to the bottom of the opening.

1203.5.2 Contaminants exhausted. Contaminant sources in naturally ventilated spaces shall be removed in accordance with the *Mechanical Code* and the *Fire Code*.

1203.5.2.1 Bathrooms. Rooms containing bathtubs, showers, spas and similar bathing fixtures shall be mechanically ventilated in accordance with the *Mechanical Code*.

1203.5.3 Openings on yards or courts. Where natural *ventilation* is to be provided by openings onto *yards* or *courts*, such *yards* or *courts* shall comply with Section 1206.

1203.6 Other ventilation and exhaust systems. *Ventilation* and exhaust systems for occupancies and operations involving flammable or combustible hazards or other contaminant sources as covered in the *Mechanical Code* or the *Fire Code* shall be provided as required by both codes.

SECTION 1204 TEMPERATURE CONTROL

1204.1 Equipment and systems. Interior spaces intended for human occupancy shall be provided with active or passive space heating systems capable of maintaining an indoor temperature of not less than 68°F (20°C) at a point 3 feet (914 mm) above the floor on the design heating day.

Exceptions: Space heating systems are not required for:

1. Interior spaces where the primary purpose of the space is not associated with human comfort.
2. Group F, H, S or U occupancies.

SECTION 1205 LIGHTING

1205.1 General. Every space intended for human occupancy shall be provided with natural light by means of exterior glazed openings in accordance with Section 1205.2 or shall be provided with artificial light in accordance with Section 1205.3.

Exception: Artificial light shall not be used to meet the lighting requirements for bedrooms, living rooms and *sleeping units*.

1205.2 Natural light. The minimum net glazed area shall be not less than 8 percent of the floor area of the room or rooms served. At least 50 percent of required glazing shall be clear glass; it is permissible for the remainder of the required glazing to be obscure glass, glass block or other *approved* translucent material.

1205.2.1 Adjoining spaces. For the purpose of natural lighting, any room is permitted to be considered as a portion of an adjoining room where one-half of the area of the common wall provides an opening of not less than one-

tenth of the floor area of the interior room or 25 square feet (2.32 m²), whichever is greater.

1. It is permissible for glazing to fill a portion or all of the required opening between adjoining spaces.
2. It is permissible to install doors in openings between adjoining spaces. However, opaque portions of doors shall not contribute to meeting the minimum opening requirement of not less than one-tenth of the floor area of the interior room or 25 square feet (2.32 m²), whichever is greater.

Exception: Openings required for natural light shall be allowed to open into a sunroom with *thermal isolation* or a patio cover where the common wall provides a glazed area of not less than one-tenth of the floor area of the interior room or 20 square feet (1.86 m²), whichever is greater.

1205.2.2 Exterior openings. Exterior openings required by Section 1205.2 for natural light shall open directly onto a *public way, yard or court*, as set forth in Section 1206.

Exceptions:

1. Required exterior openings are permitted to open into a roofed porch where the porch:
 - 1.1. Abuts a *public way, yard or court*;
 - 1.2. Has a ceiling height of not less than 7 feet (2134 mm); and
 - 1.3. Has a longer side at least 65 percent open and unobstructed.
2. Skylights are not required to open directly onto a *public way, yard or court*.

1205.3 Artificial light. Artificial light shall be provided that is adequate to provide an average illumination of 10 footcandles (107 lux) over the area of the room at a height of 30 inches (762 mm) above the floor level.

1205.4 Stairway illumination. *Stairways* within *dwelling units* and *exterior stairways* serving a *dwelling unit* shall have an illumination level on tread runs of not less than 1 footcandle (11 lux). *Stairways* in other occupancies shall be governed by Chapter 10.

1205.4.1 Controls. The control for activation of the required *stairway* lighting shall be in accordance with NFPA 70.

1205.5 Emergency egress lighting. The *means of egress* shall be illuminated in accordance with Section 1008.1.

SECTION 1206 YARDS OR COURTS

1206.1 General. This section shall apply to *yards* and *courts* adjacent to exterior openings that provide natural light or ventilation. Such *yards* and *courts* shall be on the same *lot* as the building.

1206.2 Yards. *Yards* shall be not less than 3 feet (914 mm) in width for buildings two *stories* or less above *grade plane*. For buildings more than two *stories above grade plane*, the mini-

um width of the *yard* shall be increased at the rate of 1 foot (305 mm) for each additional *story*. For buildings exceeding 14 *stories above grade plane*, the required width of the *yard* shall be computed on the basis of 14 *stories above grade plane*.

1206.3 Courts. *Courts* shall be not less than 3 feet (914 mm) in width. *Courts* having windows opening on opposite sides shall be not less than 6 feet (1829 mm) in width. *Courts* shall be not less than 10 feet (3048 mm) in length unless bounded on one end by a *public way* or *yard*. For buildings more than two *stories above grade plane*, the *court* shall be increased 1 foot (305 mm) in width and 2 feet (610 mm) in length for each additional *story*. For buildings exceeding 14 *stories above grade plane*, the required dimensions shall be computed on the basis of 14 *stories above grade plane*.

1206.3.1 Court access. Access shall be provided to the bottom of *courts* for cleaning purposes.

1206.3.2 Air intake. *Courts* more than two *stories* in height shall be provided with a horizontal air intake at the bottom not less than 10 square feet (0.93 m²) in area and leading to the exterior of the building unless abutting a *yard* or *public way*.

1206.3.3 Court drainage. The bottom of every *court* shall be properly graded and drained to a public sewer or other *approved* disposal system complying with the *Plumbing Code*.

SECTION 1207 SOUND TRANSMISSION

1207.1 Scope. This section shall apply to common interior walls, partitions and floor/ceiling assemblies between adjacent *dwelling units* and *sleeping units* or between *dwelling units* and *sleeping units* and adjacent public areas such as halls, *corridors*, *stairs*, service areas, or Group A-2 occupancies.

1207.2 Interior sound. Walls, partitions and floor/ceiling assemblies separating *dwelling units* and *sleeping units* from each other or from public or service areas shall have a sound transmission class (STC) of not less than 50 (45 if field tested) for air-borne noise when tested in accordance with ASTM E90. Walls, partitions and floor/ceiling assemblies separating Group A-2 occupancies from *dwelling units* and *sleeping units* shall have an STC of not less than 55 and shall be field tested to achieve a rating of not less than 50 for air-borne noise. Penetrations or openings in construction assemblies for piping; electrical devices; recessed cabinets; bathtubs; soffits; or heating, ventilating or exhaust ducts shall be sealed, lined, insulated or otherwise treated to maintain the required ratings. This requirement shall not apply to *dwelling unit* and *sleeping unit* entrance doors; however, such doors shall be tight fitting to the frame and sill.

Exception: Group A-2 occupancies that do not utilize amplified music as part of their use shall be exempt from these provisions.

1207.3 Structure-borne sound. Floor/ceiling assemblies between *dwelling units* and *sleeping units* or between a *dwell-*

ing unit or sleeping unit and a public or service area within the structure shall have an impact insulation class rating of not less than 50, or not less than 45 if field tested, when tested in accordance with ASTM E492.

SECTION 1208 INTERIOR SPACE DIMENSIONS

1208.1 Minimum room widths. *Habitable spaces*, other than a kitchen, shall be not less than 7 feet (2134 mm) in any plan dimension. Kitchens shall have a clear passageway of not less than 3 feet (914 mm) between counter fronts and appliances or counter fronts and walls.

1208.2 Minimum ceiling heights. Occupiable spaces, *habitable spaces* and *corridors* shall have a ceiling height of not less than 7 feet 6 inches (2286 mm). Bathrooms, toilet rooms, kitchens, storage rooms and laundry rooms shall have a ceiling height of not less than 7 feet (2134 mm).

Exceptions:

1. In one- and two-family *dwelling*s, beams or girders spaced not less than 4 feet (1219 mm) on center shall be permitted to project not more than 6 inches (152 mm) below the required ceiling height.
2. If any room in a building has a sloped ceiling, the prescribed ceiling height for the room is required in one-half the area thereof. Any portion of the room measuring less than 5 feet (1524 mm) from the finished floor to the ceiling shall not be included in any computation of the minimum area thereof.
3. The height of *mezzanines* and spaces below *mezzanines* shall be in accordance with Section 505.1.
4. Corridors contained within a *dwelling unit* or *sleeping unit* in a Group R occupancy shall have a ceiling height of not less than 7 feet (2134 mm).

1208.2.1 Furred ceiling. Any room with a furred ceiling shall be required to have the minimum ceiling height in two-thirds of the area thereof, but in no case shall the height of the furred ceiling be less than 7 feet (2134 mm).

1208.3 Room area. Every *dwelling unit* shall have no fewer than one room that shall have not less than 120 square feet (11.2 m²) of *net floor area*. Other habitable rooms shall have a *net floor area* of not less than 70 square feet (6.5 m²).

Exception: Kitchens are not required to be of a minimum floor area.

1208.4 Efficiency dwelling units. An efficiency living unit shall conform to the requirements of the code except as modified herein:

1. The unit shall have a living room of not less than 220 square feet (20.4 m²) of floor area. An additional 100 square feet (9.3 m²) of floor area shall be provided for each occupant of such unit in excess of two.
2. The unit shall be provided with a separate closet.
3. The unit shall be provided with a kitchen sink, cooking appliance and refrigeration facilities, each having a clear working space of not less than 30 inches (762

mm) in front. Light and *ventilation* conforming to this code shall be provided.

4. The unit shall be provided with a separate bathroom containing a water closet, lavatory and bathtub or shower.

SECTION 1209 ACCESS TO UNOCCUPIED SPACES

1209.1 Crawl spaces. Crawl spaces shall be provided with not fewer than one access opening that shall be not less than 18 inches by 24 inches (457 mm by 610 mm).

1209.2 Attic spaces. An opening not less than 20 inches by 30 inches (559 mm by 762 mm) shall be provided to any *attic* area having a clear height of over 30 inches (762 mm). Clear headroom of not less than 30 inches (762 mm) shall be provided in the *attic* space at or above the access opening.

1209.3 Mechanical appliances. Access to mechanical appliances installed in under-floor areas, in *attic* spaces and on roofs or elevated structures shall be in accordance with the *Mechanical Code*.

SECTION 1210 TOILET AND BATHROOM REQUIREMENTS

1210.1 Required fixtures. The number and type of plumbing fixtures provided in any occupancy shall comply with Chapter 29.

1210.2 Finish materials. Walls, floors and partitions in toilet and bathrooms shall comply with Sections 1210.2.1 through 1210.2.4.

1210.2.1 Floors and wall bases. In other than *dwelling units*, toilet, bathing and shower room floor finish materials shall have a smooth, hard, nonabsorbent surface. The intersections of such floors with walls shall have a smooth, hard, nonabsorbent vertical base that extends upward onto the walls not less than 4 inches (102 mm).

1210.2.2 Walls and partitions. Walls and partitions within 2 feet (610 mm) of service sinks, urinals and water closets shall have a smooth, hard, nonabsorbent surface, to a height of not less than 4 feet (1219 mm) above the floor, and except for structural elements, the materials used in such walls shall be of a type that is not adversely affected by moisture.

Exception: This section does not apply to the following buildings and spaces:

1. Dwelling units and sleeping units.
2. Toilet rooms that are not accessible to the public and that have not more than one water closet.

Accessories such as grab bars, towel bars, paper dispensers and soap dishes, provided on or within walls, shall be installed and sealed to protect structural elements from moisture.

1210.2.3 Showers. Shower compartments and walls above bathtubs with installed shower heads shall be finished with

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a smooth, nonabsorbent surface to a height not less than 72 inches (1829 mm) above the drain inlet.

1210.2.4 Waterproof joints. Built-in tubs with showers shall have waterproof joints between the tub and adjacent wall.

1210.3 Privacy. Privacy at water closets and urinals shall be provided in accordance with Sections 1210.3.1 and 1210.3.2.

1210.3.1 Water closet compartment. Each water closet utilized by the public or employees shall occupy a separate compartment with walls or partitions and a door enclosing the fixtures to ensure privacy.

Exceptions:

1. Water closet compartments shall not be required in a single-occupant toilet room with a lockable door.
2. Toilet rooms located in child day care facilities and containing two or more water closets shall be permitted to have one water closet without an enclosing compartment.
3. This provision is not applicable to toilet areas located within Group I-3 occupancy housing areas.

1210.3.2 Urinal partitions. Each urinal utilized by the public or employees shall occupy a separate area with walls or partitions to provide privacy. The walls or partitions shall begin at a height not more than 12 inches (305 mm) from and extend not less than 60 inches (1524 mm) above the finished floor surface. The walls or partitions shall extend from the wall surface at each side of the urinal not less than 18 inches (457 mm) or to a point not less than 6 inches (152 mm) beyond the outermost front lip of the urinal measured from the finished backwall surface, whichever is greater.

Exceptions:

1. Urinal partitions shall not be required in a single-occupant or family or assisted-use toilet room with a lockable door.
2. Toilet rooms located in child day care facilities and containing two or more urinals shall be permitted to have one urinal without partitions.

CHAPTER 13

ENERGY EFFICIENCY

SECTION 1301

GENERAL

1301.1 Scope. This chapter governs the design and construction of buildings for energy efficiency.

1301.1.1 Criteria. Buildings shall be designed and constructed in accordance with the *Energy Conservation Code*.

CHAPTER 14

EXTERIOR WALLS

SECTION 1401 GENERAL

1401.1 Scope. The provisions of this chapter shall establish the minimum requirements for exterior walls; *exterior wall* coverings; *exterior wall* openings; exterior windows and doors; architectural *trim*; balconies and similar projections; and bay and oriel windows.

SECTION 1402 DEFINITIONS

1402.1 Definitions. The following terms are defined in Chapter 2:

ADHERED MASONRY VENEER.

ANCHORED MASONRY VENEER.

BACKING.

EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS).

EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) WITH DRAINAGE.

EXTERIOR WALL.

EXTERIOR WALL COVERING.

EXTERIOR WALL ENVELOPE.

FENESTRATION.

FIBER-CEMENT SIDING.

HIGH-PRESSURE DECORATIVE EXTERIOR-GRADE COMPACT LAMINATE (HPL).

HIGH-PRESSURE DECORATIVE EXTERIOR-GRADE COMPACT LAMINATE (HPL) SYSTEM.

METAL COMPOSITE MATERIAL (MCM).

METAL COMPOSITE MATERIAL (MCM) SYSTEM.

POLYPROPYLENE SIDING.

PORCELAIN TILE.

VENEER.

VINYL SIDING.

WATER-RESISTIVE BARRIER.

SECTION 1403 PERFORMANCE REQUIREMENTS

1403.1 General. The provisions of this section shall apply to exterior walls, wall coverings and components thereof.

1403.2 Weather protection. Exterior walls shall provide the building with a weather-resistant *exterior wall envelope*. The *exterior wall envelope* shall include flashing, as described in Section 1405.4. The *exterior wall envelope* shall be designed and constructed in such a manner as to prevent the accumula-

tion of water within the wall assembly by providing a *water-resistive barrier* behind the exterior veneer, as described in Section 1404.2, and a means for draining water that enters the assembly to the exterior. Protection against condensation in the *exterior wall* assembly shall be provided in accordance with Section 1405.3.

Exceptions:

1. A weather-resistant *exterior wall envelope* shall not be required over concrete or masonry walls designed in accordance with Chapters 19 and 21, respectively.
2. Compliance with the requirements for a means of drainage, and the requirements of Sections 1404.2 and 1405.4, shall not be required for an *exterior wall envelope* that has been demonstrated through testing to resist wind-driven rain, including joints, penetrations and intersections with dissimilar materials, in accordance with ASTM E331 under the following conditions:
 - 2.1. *Exterior wall envelope* test assemblies shall include at least one opening, one control joint, one wall/eave interface and one wall sill. Tested openings and penetrations shall be representative of the intended end-use configuration.
 - 2.2. *Exterior wall envelope* test assemblies shall be at least 4 feet by 8 feet (1219 mm by 2438 mm) in size.
 - 2.3. *Exterior wall envelope* assemblies shall be tested at a minimum differential pressure of 6.24 pounds per square foot (psf) (0.297 kN/m²).
 - 2.4. *Exterior wall envelope* assemblies shall be subjected to a minimum test exposure duration of 2 hours.

The *exterior wall envelope* design shall be considered to resist wind-driven rain where the results of testing indicate that water did not penetrate control joints in the *exterior wall envelope*, joints at the perimeter of openings or intersections of terminations with dissimilar materials.

3. Exterior insulation and finish systems (EIFS) complying with Section 1408.4.1.

1403.3 Structural. *Exterior walls*, and the associated openings, shall be designed and constructed to resist safely the superimposed loads required by Chapter 16.

1403.4 Fire resistance. *Exterior walls* shall be fire-resistance rated as required by other sections of this code with opening protection as required by Chapter 7.

1403.5 Vertical and lateral flame propagation. Exterior walls on buildings of Type I, II, III or IV construction that are

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greater than 40 feet (12 192 mm) in height above grade plane and contain a combustible *water-resistive barrier* shall be tested in accordance with and comply with the acceptance criteria of NFPA 285. For the purposes of this section, fenestration products and flashing of fenestration products shall not be considered part of the *water-resistive barrier*.

Exceptions:

1. Walls in which the *water-resistive barrier* is the only combustible component and the *exterior wall* has a wall covering of brick, concrete, stone, terra cotta, stucco or steel with minimum thicknesses in accordance with Table 1405.2.
2. Walls in which the *water-resistive barrier* is the only combustible component and the *water-resistive barrier* has a peak heat release rate of less than 150 kW/m², a total heat release of less than 20 MJ/m² and an effective heat of combustion of less than 18 MJ/kg as determined in accordance with ASTM E1354 and has a flame spread index of 25 or less and a smoke-developed index of 450 or less as determined in accordance with ASTM E84 or UL 723. The ASTM E1354 test shall be conducted on specimens at the thickness intended for use, in the horizontal orientation and at an incident radiant heat flux of 50 kW/m².

1403.6 Flood resistance. For buildings in flood hazard areas as established in Section 1612.3, *exterior walls* extending below the elevation required by Section 1612 shall be constructed with flood-damage-resistant materials.

1403.7 Flood resistance for coastal high-hazard areas and coastal A zones. For buildings in coastal high-hazard areas and coastal A zones as established in Section 1612.3, electrical, mechanical and plumbing system components shall not be mounted on or penetrate through exterior walls that are designed to break away under flood loads.

SECTION 1404 MATERIALS

1404.1 General. Materials used for the construction of *exterior walls* shall comply with the provisions of this section. Materials not prescribed herein shall be permitted, provided that any such alternative has been *approved*.

1404.2 Water-resistive barrier. Not fewer than one layer of No.15 asphalt felt, complying with ASTM D226 for Type 1 felt or other *approved* materials, shall be attached to the studs or sheathing, with flashing as described in Section 1405.4, in such a manner as to provide a continuous *water-resistive barrier* behind the *exterior wall* veneer.

1404.3 Wood. *Exterior walls* of wood construction shall be designed and constructed in accordance with Chapter 23.

1404.3.1 Basic hardboard. Basic hardboard shall conform to the requirements of AHA A135.4.

1404.3.2 Hardboard siding. Hardboard siding shall conform to the requirements of AHA A135.6 and, where used structurally, shall be so identified by the *label* of an *approved* agency.

1404.4 Masonry. *Exterior walls* of masonry construction shall be designed and constructed in accordance with this section and Chapter 21. Masonry units, mortar and metal accessories used in anchored and adhered veneer shall meet the physical requirements of Chapter 21. The backing of anchored and adhered veneer shall be of concrete, masonry, steel framing or wood framing. Continuous insulation meeting the applicable requirements of this code shall be permitted between the backing and the masonry veneer.

1404.5 Metal. *Exterior walls* constructed of cold-formed steel, structural steel or aluminum shall be designed in accordance with Chapters 22 and 20, respectively.

1404.5.1 Aluminum siding. Aluminum siding shall conform to the requirements of AAMA 1402.

1404.5.2 Cold-rolled copper. Copper shall conform to the requirements of ASTM B370.

1404.5.3 Lead-coated copper. Lead-coated copper shall conform to the requirements of ASTM B101.

1404.6 Concrete. *Exterior walls* of concrete construction shall be designed and constructed in accordance with Chapter 19.

1404.7 Glass-unit masonry. *Exterior walls* of glass-unit masonry shall be designed and constructed in accordance with Chapter 21.

1404.8 Plastics. Plastic panel, apron or spandrel walls as defined in this code shall not be limited in thickness, provided that such plastics and their assemblies conform to the requirements of Chapter 26 and are constructed of *approved* weather-resistant materials of adequate strength to resist the wind loads for cladding specified in Chapter 16.

1404.9 Vinyl siding. Vinyl siding shall be certified and labeled as conforming to the requirements of ASTM D3679 by an *approved* quality control agency.

1404.10 Fiber-cement siding. Fiber-cement siding shall conform to the requirements of ASTM C1186, Type A (or ISO 8336, Category A), and shall be so identified on labeling listing an *approved* quality control agency.

1404.11 Exterior insulation and finish systems. Exterior insulation and finish systems (EIFS) and exterior insulation and finish systems (EIFS) with drainage shall comply with Section 1408.

1404.12 Polypropylene siding. Polypropylene siding shall be certified and labeled as conforming to the requirements of ASTM D7254 and those of Section 1404.12.1 or 1404.12.2 by an approved quality control agency. Polypropylene siding shall be installed in accordance with the requirements of Section 1405.18 and in accordance with the manufacturer's instructions. Polypropylene siding shall be secured to the building so as to provide weather protection for the exterior walls of the building.

1404.12.1 Flame spread index. The certification of the flame spread index shall be accompanied by a test report stating that all portions of the test specimen ahead of the flame front remained in position during the test in accordance with ASTM E84 or UL 723.

1404.12.2 Fire separation distance. The fire separation distance between a building with polypropylene siding and the adjacent building shall be not less than 10 feet (3048 mm).

1404.13 Foam plastic insulation. Foam plastic insulation used in *exterior wall covering* assemblies shall comply with Chapter 26.

SECTION 1405 INSTALLATION OF WALL COVERINGS

1405.1 General. *Exterior wall coverings* shall be designed and constructed in accordance with the applicable provisions of this section.

1405.2 Weather protection. *Exterior walls* shall provide weather protection for the building. The materials of the minimum nominal thickness specified in Table 1405.2 shall be acceptable as *approved* weather coverings.

1405.3 Vapor retarders. Vapor retarders as described in Section 1405.3.3 shall be provided in accordance with Sections 1405.3.1 and 1405.3.2, or an approved design using accepted engineering practice for hygrothermal analysis.

1405.3.1 Class I and II vapor retarders. Class I and II vapor retarders shall not be provided on the interior side of frame walls in Zones 1 and 2. Class I vapor retarders shall not be provided on the interior side of frame walls in Zones 3 and 4. Class I or II vapor retarders shall be provided on the interior side of frame walls in Zones 5, 6, 7, 8 and Marine 4. The appropriate zone shall be selected in accordance with Chapter 3 [CE] of the *Energy Conservation Code-Commercial Provisions*.

Exceptions:

1. Basement walls.
2. Below-grade portion of any wall.
3. Construction where moisture or its freezing will not damage the materials.
4. Conditions where Class III vapor retarders are required in Section 1405.3.2.

1405.3.2 Class III vapor retarders. Class III vapor retarders shall be permitted where any one of the conditions in Table 1405.3.2 is met. Only Class III vapor retarders shall be used on the interior side of frame walls where foam plastic insulating sheathing with a perm rating of less than 1 is applied in accordance with Table 1405.3.2 on the exterior side of the frame wall.

**TABLE 1405.2
MINIMUM THICKNESS OF WEATHER COVERINGS**

| COVERING TYPE | MINIMUM THICKNESS (inches) |
|--|----------------------------|
| Adhered masonry veneer | 0.25 |
| Aluminum siding | 0.019 |
| Anchored masonry veneer | 2.625 |
| Asbestos-cement boards | 0.125 |
| Asbestos shingles | 0.156 |
| Cold-rolled copper ^d | 0.0216 nominal |
| Copper shingles ^d | 0.0162 nominal |
| Exterior plywood (with sheathing) | 0.313 |
| Exterior plywood (without sheathing) | See Section 2304.6 |
| Fiber cement lap siding | 0.25 ^c |
| Fiber cement panel siding | 0.25 ^c |
| Fiberboard siding | 0.5 |
| Glass-fiber reinforced concrete panels | 0.375 |
| Hardboard siding ^c | 0.25 |
| High-yield copper ^d | 0.0162 nominal |
| Lead-coated copper ^d | 0.0216 nominal |
| Lead-coated high-yield copper | 0.0162 nominal |
| Marble slabs | 1 |
| Particleboard (with sheathing) | See Section 2304.6 |
| Particleboard (without sheathing) | See Section 2304.6 |
| Porcelain tile | 0.25 |
| Steel (approved corrosion resistant) | 0.0149 |
| Stone (cast artificial, anchored) | 1.5 |
| Stone (natural) | 2 |
| Structural glass | 0.344 |
| Stucco or exterior cement plaster | |
| Three-coat work over: | |
| Metal plaster base | 0.875 ^b |
| Unit masonry | 0.625 ^b |
| Cast-in-place or precast concrete | 0.625 ^b |
| Two-coat work over: | |
| Unit masonry | 0.5 ^b |
| Cast-in-place or precast concrete | 0.375 ^b |
| Terra cotta (anchored) | 1 |
| Terra cotta (adhered) | 0.25 |
| Vinyl siding | 0.035 |
| Wood shingles | 0.375 |
| Wood siding (without sheathing) ^a | 0.5 |

For SI: 1 inch = 25.4 mm, 1 ounce = 28.35 g, 1 square foot = 0.093 m².

a. Wood siding of thicknesses less than 0.5 inch shall be placed over sheathing that conforms to Section 2304.6.

b. Exclusive of texture.

c. As measured at the bottom of decorative grooves.

d. 16 ounces per square foot for cold-rolled copper and lead-coated copper, 12 ounces per square foot for copper shingles, high-yield copper and lead-coated high-yield copper.

TABLE 1405.3.2
CLASS III VAPOR RETARDERS

| ZONE | CLASS III VAPOR RETARDERS PERMITTED FOR:* |
|-------------|--|
| Marine 4 | Vented cladding over wood structural panels Vented cladding over fiberboard Vented cladding over gypsum Insulated sheathing with R -value $\geq R2.5$ over 2×4 wall Insulated sheathing with R -value $\geq R3.75$ over 2×6 wall |
| 5 | Vented cladding over wood structural panels Vented cladding over fiberboard Vented cladding over gypsum Insulated sheathing with R -value $\geq R5$ over 2×4 wall Insulated sheathing with R -value $\geq R7.5$ over 2×6 wall |
| 6 | Vented cladding over fiberboard Vented cladding over gypsum Insulated sheathing with R -value $\geq R7.5$ over 2×4 wall Insulated sheathing with R -value $\geq R11.25$ over 2×6 wall |
| 7 and 8 | Insulated sheathing with R -value $\geq R10$ over 2×4 wall Insulated sheathing with R -value $\geq R15$ over 2×6 wall |

For SI: 1 pound per cubic foot = 16 kg/m³.

- a. Spray foam with a minimum density of 2 lbs/ft³ applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the insulating sheathing requirement where the spray foam R -value meets or exceeds the specified insulating sheathing R -value.

1405.3.3 Material vapor retarder class. The *vapor retarder class* shall be based on the manufacturer's certified testing or a tested assembly.

The following shall be deemed to meet the class specified:

- Class I: Sheet polyethylene, nonperforated aluminum foil with a perm rating of less than or equal to 0.1.
- Class II: Kraft-faced fiberglass batts or paint with a perm rating greater than 0.1 and less than or equal to 1.0.
- Class III: Latex or enamel paint with a perm rating of greater than 1.0 and less than or equal to 10.0.

1405.3.4 Minimum clear airspaces and vented openings for vented cladding. For the purposes of this section, vented cladding shall include the following minimum clear airspaces:

1. Vinyl lap or horizontal aluminum siding applied over a weather-resistive barrier as specified in this chapter.
2. Brick veneer with a clear airspace as specified in this code.
3. Other *approved* vented claddings.

1405.4 Flashing. Flashing shall be installed in such a manner so as to prevent moisture from entering the wall or to redirect that moisture to the exterior. Flashing shall be installed at the perimeters of exterior door and window assemblies, penetrations and terminations of *exterior wall* assemblies, *exterior wall* intersections with roofs, chimneys, porches, decks, bal-

conies and similar projections and at built-in gutters and similar locations where moisture could enter the wall. Flashing with projecting flanges shall be installed on both sides and the ends of copings, under sills and continuously above projecting *trim*.

1405.4.1 Exterior wall pockets. In exterior walls of buildings or structures, wall pockets or crevices in which moisture can accumulate shall be avoided or protected with caps or drips, or other *approved* means shall be provided to prevent water damage.

1405.4.2 Masonry. Flashing and weep holes in anchored veneer shall be located in the first course of masonry above finished ground level above the foundation wall or slab, and other points of support, including structural floors, shelf angles and lintels where anchored veneers are designed in accordance with Section 1405.6.

1405.5 Wood veneers. Wood veneers on exterior walls of buildings of Type I, II, III and IV construction shall be not less than 1 inch (25 mm) nominal thickness, 0.438-inch (11.1 mm) exterior hardboard siding or 0.375-inch (9.5 mm) exterior-type wood structural panels or particleboard and shall conform to the following:

1. The veneer shall not exceed 40 feet (12 190 mm) in height above grade. Where fire-retardant-treated wood is used, the height shall not exceed 60 feet (18 290 mm) in height above grade.
2. The veneer is attached to or furred from a noncombustible backing that is fire-resistance rated as required by other provisions of this code.
3. Where open or spaced wood veneers (without concealed spaces) are used, they shall not project more than 24 inches (610 mm) from the building wall.

1405.6 Anchored masonry veneer. Anchored masonry veneer shall comply with the provisions of Sections 1405.6, 1405.7, 1405.8 and 1405.9 and Sections 12.1 and 12.2 of TMS 402/ACI 530/ASCE 5.

1405.6.1 Tolerances. Anchored masonry veneers in accordance with Chapter 14 are not required to meet the tolerances in Article 3.3 F1 of TMS 602/ACI 530.1/ASCE 6.

1405.6.2 Seismic requirements. Anchored masonry veneer located in Seismic Design Category C, D, E or F shall conform to the requirements of Section 12.2.2.10 of TMS 402/ACI 530/ASCE 5.

1405.7 Stone veneer. Anchored stone veneer units not exceeding 10 inches (254 mm) in thickness shall be anchored directly to masonry, concrete or to stud construction by one of the following methods:

1. With concrete or masonry backing, anchor ties shall be not less than 0.1055-inch (2.68 mm) corrosion-resistant wire, or *approved* equal, formed beyond the base of the backing. The legs of the loops shall be not less than 6 inches (152 mm) in length bent at right angles and laid in the mortar joint, and spaced so that the eyes or loops are 12 inches (305 mm) maximum on center in both directions. There shall be provided not less than a 0.1055-inch (2.68 mm) corrosion-resistant wire tie, or *approved* equal, threaded through the exposed loops for

every 2 square feet (0.2 m²) of stone veneer. This tie shall be a loop having legs not less than 15 inches (381 mm) in length bent so that the tie will lie in the stone veneer mortar joint. The last 2 inches (51 mm) of each wire leg shall have a right-angle bend. One-inch (25 mm) minimum thickness of cement grout shall be placed between the backing and the stone veneer.

2. With wood stud backing, a 2-inch by 2-inch (51 by 51 mm) 0.0625-inch (1.59 mm) zinc-coated or nonmetallic coated wire mesh with two layers of water-resistive barrier in accordance with Section 1404.2 shall be applied directly to wood studs spaced not more than 16 inches (406 mm) on center. On studs, the mesh shall be attached with 2-inch-long (51 mm) corrosion-resistant steel wire furring nails at 4 inches (102 mm) on center providing a minimum 1.125-inch (29 mm) penetration into each stud and with 8d annular threaded nails at 8 inches (203 mm) on center, into top and bottom plates or with equivalent wire ties. There shall be not less than a 0.1055-inch (2.68 mm) zinc-coated or nonmetallic coated wire, or approved equal, attached to the stud with not smaller than an 8d (0.120 in. diameter) annular threaded nail for every 2 square feet (0.2 m²) of stone veneer. This tie shall be a loop having legs not less than 15 inches (381 mm) in length, so bent that the tie will lie in the stone veneer mortar joint. The last 2 inches (51 mm) of each wire leg shall have a right-angle bend. One-inch (25 mm) minimum thickness of cement grout shall be placed between the backing and the stone veneer.
3. With cold-formed steel stud backing, a 2-inch by 2-inch (51 by 51 mm) 0.0625-inch (1.59 mm) zinc-coated or nonmetallic coated wire mesh with two layers of water-resistive barrier in accordance with Section 1404.2 shall be applied directly to steel studs spaced a not more than 16 inches (406 mm) on center. The mesh shall be attached with corrosion-resistant #8 self-drilling, tapping screws at 4 inches (102 mm) on center, and at 8 inches (203 mm) on center into top and bottom tracks or with equivalent wire ties. Screws shall extend through the steel connection not fewer than three exposed threads. There shall be not less than a 0.1055-inch (2.68 mm) corrosion-resistant wire, or approved equal, attached to the stud with not smaller than a #8 self-drilling, tapping screw extending through the steel framing not fewer than three exposed threads for every 2 square feet (0.2 m²) of stone veneer. This tie shall be a loop having legs not less than 15 inches (381 mm) in length, so bent that the tie will lie in the stone veneer mortar joint. The last 2 inches (51 mm) of each wire leg shall have a right-angle bend. One-inch (25 mm) minimum thickness of cement grout shall be placed between the backing and the stone veneer. The cold-formed steel framing members shall have a minimum bare steel thickness of 0.0428 inches (1.087 mm).

1405.8 Slab-type veneer. Anchored slab-type veneer units not exceeding 2 inches (51 mm) in thickness shall be anchored directly to masonry, concrete or light-frame construction. For veneer units of marble, travertine, granite or

other stone units of slab form, ties of corrosion-resistant dowels in drilled holes shall be located in the middle third of the edge of the units, spaced not more than 24 inches (610 mm) apart around the periphery of each unit with not less than four ties per veneer unit. Units shall not exceed 20 square feet (1.9 m²) in area. If the dowels are not tight fitting, the holes shall be drilled not more than 0.063 inch (1.6 mm) larger in diameter than the dowel, with the hole countersunk to a diameter and depth equal to twice the diameter of the dowel in order to provide a tight-fitting key of cement mortar at the dowel locations where the mortar in the joint has set. Veneer ties shall be corrosion-resistant metal capable of resisting, in tension or compression, a force equal to two times the weight of the attached veneer. If made of sheet metal, veneer ties shall be not smaller in area than 0.0336 by 1 inch (0.853 by 25 mm) or, if made of wire, not smaller in diameter than 0.1483-inch (3.76 mm) wire.

1405.9 Terra cotta. Anchored terra cotta or ceramic units not less than 1⁵/₈ inches (41 mm) thick shall be anchored directly to masonry, concrete or stud construction. Tied terra cotta or ceramic veneer units shall be not less than 1⁵/₈ inches (41 mm) thick with projecting dovetail webs on the back surface spaced approximately 8 inches (203 mm) on center. The facing shall be tied to the backing wall with corrosion-resistant metal anchors of not less than No. 8 gage wire installed at the top of each piece in horizontal bed joints not less than 12 inches (305 mm) nor more than 18 inches (457 mm) on center; these anchors shall be secured to 1/4-inch (6.4 mm) corrosion-resistant pencil rods that pass through the vertical aligned loop anchors in the backing wall. The veneer ties shall have sufficient strength to support the full weight of the veneer in tension. The facing shall be set with not less than a 2-inch (51 mm) space from the backing wall and the space shall be filled solidly with Portland cement grout and pea gravel. Immediately prior to setting, the backing wall and the facing shall be drenched with clean water and shall be distinctly damp when the grout is poured.

1405.10 Adhered masonry veneer. Adhered masonry veneer shall comply with the applicable requirements in this section and Sections 12.1 and 12.3 of TMS 402/ACI 530/ASCE 5.

1405.10.1 Exterior adhered masonry veneer. Exterior adhered masonry veneer shall be installed in accordance with Section 1405.10 and the manufacturer's instructions.

1405.10.1.1 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section 2510.6.

1405.10.1.2 Flashing. Flashing shall comply with the applicable requirements of Section 1405.4 and the following.

1405.10.1.2.1 Flashing at foundation. A corrosion-resistant screed or flashing of a minimum 0.019-inch (0.48 mm) or 26 gage galvanized or plastic with a minimum vertical attachment flange of 3¹/₂ inches (89 mm) shall be installed to extend not less than 1 inch (25 mm) below the foundation plate line on exterior stud walls in accordance with Section 1405.4. The water-resistive barrier shall lap over the exterior of the attachment flange of the screed or flashing.

1405.10.1.3 Clearances. On exterior stud walls, adhered masonry veneer shall be installed not less than 4 inches (102 mm) above the earth, or not less than 2 inches (51 mm) above paved areas, or not less than $\frac{1}{2}$ inch (12.7 mm) above exterior walking surfaces that are supported by the same foundation that supports the exterior wall.

1405.10.1.4 Adhered masonry veneer installed with lath and mortar. Exterior adhered masonry veneer installed with lath and mortar shall comply with the following.

1405.10.1.4.1 Lathing. Lathing shall comply with the requirements of Section 2510.

1405.10.1.4.2 Scratch coat. A nominal $\frac{1}{2}$ -inch-thick (12.7 mm) layer of mortar complying with the material requirements of Sections 2103 and 2512.2 shall be applied, encapsulating the lathing. The surface of this mortar shall be scored horizontally, resulting in a scratch coat.

1405.10.1.4.3 Adhering veneer. The masonry veneer units shall be adhered to the mortar scratch coat with a nominal $\frac{1}{2}$ -inch-thick (12.7 mm) setting bed of mortar complying with Sections 2103 and 2512.2 applied to create a full setting bed for the back of the masonry veneer units. The masonry veneer units shall be worked into the setting bed resulting in a nominal $\frac{3}{8}$ -inch (9.5 mm) setting bed after the masonry veneer units are applied.

1405.10.1.5 Adhered masonry veneer applied directly to masonry and concrete. Adhered masonry veneer applied directly to masonry or concrete shall comply with the applicable requirements of Section 1405.10 and with the requirements of Section 1405.10.1.4 or 2510.7.

1405.10.1.6 Cold weather construction. Cold weather construction of adhered masonry veneer shall comply with the requirements of Sections 2104 and 2512.4.

1405.10.1.7 Hot weather construction. Hot weather construction of adhered masonry veneer shall comply with the requirements of Section 2104.

1405.10.2 Exterior adhered masonry veneers—porcelain tile. Adhered units shall not exceed $\frac{5}{8}$ inch (15.8 mm) thickness and 24 inches (610 mm) in any face dimension nor more than 3 square feet (0.28 m²) in total face area and shall not weigh more than 9 pounds psf (0.43 kN/m²). Porcelain tile shall be adhered to an approved backing system.

1405.10.3 Interior adhered masonry veneers. Interior adhered masonry veneers shall have a maximum weight of 20 psf (0.958 kg/m²) and shall be installed in accordance with Section 1405.10. Where the interior adhered masonry veneer is supported by wood construction, the supporting members shall be designed to limit deflection to $\frac{1}{600}$ of the span of the supporting members.

1405.11 Metal veneers. Veneers of metal shall be fabricated from *approved* corrosion-resistant materials or shall be protected front and back with porcelain enamel, or otherwise be treated to render the metal resistant to corrosion. Such veneers shall be not less than 0.0149-inch (0.378 mm) nominal thickness sheet steel mounted on wood or metal furring strips or approved sheathing on light-frame construction.

1405.11.1 Attachment. Exterior metal veneer shall be securely attached to the supporting masonry or framing members with corrosion-resistant fastenings, metal ties or by other *approved* devices or methods. The spacing of the fastenings or ties shall not exceed 24 inches (610 mm) either vertically or horizontally, but where units exceed 4 square feet (0.4 m²) in area there shall be not less than four attachments per unit. The metal attachments shall have a cross-sectional area not less than provided by W 1.7 wire. Such attachments and their supports shall be designed and constructed to resist the wind loads as specified in Section 1609 for components and cladding.

1405.11.2 Weather protection. Metal supports for exterior metal veneer shall be protected by painting, galvanizing or by other equivalent coating or treatment. Wood studs, furring strips or other wood supports for exterior metal veneer shall be *approved* pressure-treated wood or protected as required in Section 1403.2. Joints and edges exposed to the weather shall be caulked with *approved* durable waterproofing material or by other *approved* means to prevent penetration of moisture.

1405.11.3 Backup. Masonry backup shall not be required for metal veneer unless required by the fire-resistance requirements of this code.

1405.11.4 Grounding. Grounding of metal veneers on buildings shall comply with the requirements of Chapter 27 of this code.

1405.12 Glass veneer. The area of a single section of thin exterior structural glass veneer shall not exceed 10 square feet (0.93 m²) where that section is not more than 15 feet (4572 mm) above the level of the sidewalk or grade level directly below, and shall not exceed 6 square feet (0.56 m²) where it is more than 15 feet (4572 mm) above that level.

1405.12.1 Length and height. The length or height of any section of thin exterior structural glass veneer shall not exceed 48 inches (1219 mm).

1405.12.2 Thickness. The thickness of thin exterior structural glass veneer shall be not less than 0.344 inch (8.7 mm).

1405.12.3 Application. Thin exterior structural glass veneer shall be set only after backing is thoroughly dry and after application of an *approved* bond coat uniformly over the entire surface of the backing so as to effectively seal the surface. Glass shall be set in place with an *approved* mastic cement in sufficient quantity so that at least 50 percent of the area of each glass unit is directly bonded to the backing by mastic not less than $\frac{1}{4}$ inch (6.4 mm) thick and not more than $\frac{5}{8}$ inch (15.9 mm) thick. The

bond coat and mastic shall be evaluated for compatibility and shall bond firmly together.

1405.12.4 Installation at sidewalk level. Where glass extends to a sidewalk surface, each section shall rest in an *approved* metal molding, and be set at least $\frac{1}{4}$ inch (6.4 mm) above the highest point of the sidewalk. The space between the molding and the sidewalk shall be thoroughly caulked and made water tight.

1405.12.4.1 Installation above sidewalk level. Where thin exterior structural glass veneer is installed above the level of the top of a bulkhead facing, or at a level more than 36 inches (914 mm) above the sidewalk level, the mastic cement binding shall be supplemented with *approved* nonferrous metal shelf angles located in the horizontal joints in every course. Such shelf angles shall be not less than 0.0478-inch (1.2 mm) thick and not less than 2 inches (51 mm) long and shall be spaced at *approved* intervals, with not less than two angles for each glass unit. Shelf angles shall be secured to the wall or backing with expansion bolts, toggle bolts or by other *approved* methods.

1405.12.5 Joints. Unless otherwise specifically *approved* by the *building official*, abutting edges of thin exterior structural glass veneer shall be ground square. Mitered joints shall not be used except where specifically *approved* for wide angles. Joints shall be uniformly buttered with an *approved* jointing compound and horizontal joints shall be held to not less than 0.063 inch (1.6 mm) by an *approved* nonrigid substance or device. Where thin exterior structural glass veneer abuts nonresilient material at sides or top, expansion joints not less than $\frac{1}{4}$ inch (6.4 mm) wide shall be provided.

1405.12.6 Mechanical fastenings. Thin exterior structural glass veneer installed above the level of the heads of show windows and veneer installed more than 12 feet (3658 mm) above sidewalk level shall, in addition to the mastic cement and shelf angles, be held in place by the use of fastenings at each vertical or horizontal edge, or at the four corners of each glass unit. Fastenings shall be secured to the wall or backing with expansion bolts, toggle bolts or by other methods. Fastenings shall be so designed as to hold the glass veneer in a vertical plane independent of the mastic cement. Shelf angles providing both support and fastenings shall be permitted.

1405.12.7 Flashing. Exposed edges of thin exterior structural glass veneer shall be flashed with overlapping corrosion-resistant metal flashing and caulked with a waterproof compound in a manner to effectively prevent the entrance of moisture between the glass veneer and the backing.

1405.13 Exterior windows and doors. Windows and doors installed in exterior walls shall conform to the testing and performance requirements of Section 1709.5.

1405.13.1 Installation. Windows and doors shall be installed in accordance with *approved* manufacturer's instructions. Fastener size and spacing shall be provided in such instructions and shall be calculated based on maximum loads and spacing used in the tests.

1405.14 Vinyl siding. Vinyl siding conforming to the requirements of this section and complying with ASTM D3679 shall be permitted on exterior walls of buildings located in areas where V_{asd} as determined in accordance with Section 1609.3.1 does not exceed 100 miles per hour (45 m/s) and the *building height* is less than or equal to 40 feet (12 192 mm) in Exposure C. Where construction is located in areas where V_{asd} as determined in accordance with Section 1609.3.1 exceeds 100 miles per hour (45 m/s), or building heights are in excess of 40 feet (12 192 mm), tests or calculations indicating compliance with Chapter 16 shall be submitted. Vinyl siding shall be secured to the building so as to provide weather protection for the exterior walls of the building.

1405.14.1 Application. The siding shall be applied over sheathing or materials listed in Section 2304.6. Siding shall be applied to conform to the *water-resistive barrier* requirements in Section 1403. Siding and accessories shall be installed in accordance with *approved* manufacturer's instructions. Unless otherwise specified in the *approved* manufacturer's instructions, nails used to fasten the siding and accessories shall have a minimum 0.313-inch (7.9 mm) head diameter and $\frac{1}{8}$ -inch (3.18 mm) shank diameter. The nails shall be corrosion resistant and shall be long enough to penetrate the studs or nailing strip at least $\frac{3}{4}$ inch (19 mm). For cold-formed steel light-frame construction, corrosion-resistant fasteners shall be used. Screw fasteners shall penetrate the cold-formed steel framing at least three exposed threads. Other fasteners shall be installed in accordance with the approved construction documents and manufacturer's instructions. Where the siding is installed horizontally, the fastener spacing shall not exceed 16 inches (406 mm) horizontally and 12 inches (305 mm) vertically. Where the siding is installed vertically, the fastener spacing shall not exceed 12 inches (305 mm) horizontally and 12 inches (305 mm) vertically.

1405.15 Cement plaster. Cement plaster applied to exterior walls shall conform to the requirements specified in Chapter 25.

1405.16 Fiber-cement siding. Fiber-cement siding complying with Section 1404.10 shall be permitted on exterior walls of Type I, II, III, IV and V construction for wind pressure resistance or wind speed exposures as indicated by the manufacturer's listing and *label* and *approved* installation instructions. Where specified, the siding shall be installed over sheathing or materials *listed* in Section 2304.6 and shall be installed to conform to the *water-resistive barrier* requirements in Section 1403. Siding and accessories shall be installed in accordance with *approved* manufacturer's instructions. Unless otherwise specified in the *approved* manufacturer's instructions, nails used to fasten the siding to wood studs shall be corrosion-resistant round head smooth shank and shall be long enough to penetrate the studs at least 1 inch (25 mm). For cold-formed steel light-frame construction, corrosion-resistant fasteners shall be used. Screw fasteners shall penetrate the cold-formed steel framing at least three exposed full threads. Other fasteners shall be installed in accordance with the approved construction documents and manufacturer's instructions.

1405.16.1 Panel siding. Fiber-cement panels shall comply with the requirements of ASTM C1186, Type A, minimum Grade II (or ISO 8336, Category A, minimum Class 2). Panels shall be installed with the long dimension either parallel or perpendicular to framing. Vertical and horizontal joints shall occur over framing members and shall be protected with caulking, with battens or flashing, or be vertical or horizontal shiplap or otherwise designed to comply with Section 1403.2. Panel siding shall be installed with fasteners in accordance with the *approved* manufacturer's instructions.

1405.16.2 Lap siding. Fiber-cement lap siding having a maximum width of 12 inches (305 mm) shall comply with the requirements of ASTM C1186, Type A, minimum Grade II (or ISO 8336, Category A, minimum Class 2). Lap siding shall be lapped a minimum of 1 $\frac{1}{4}$ inches (32 mm) and lap siding not having tongue-and-groove end joints shall have the ends protected with caulking, covered with an H-section joint cover, located over a strip of flashing or shall be otherwise designed to comply with Section 1403.2. Lap siding courses shall be installed with the fastener heads exposed or concealed in accordance with the *approved* manufacturer's instructions.

1405.17 Fastening. Weather boarding and wall coverings shall be securely fastened with aluminum, copper, zinc, zinc-coated or other *approved* corrosion-resistant fasteners in accordance with the nailing schedule in Table 2304.10.1 or the *approved* manufacturer's instructions. Shingles and other weather coverings shall be attached with appropriate standard-shingle nails to furring strips securely nailed to studs, or with *approved* mechanically bonding nails, except where sheathing is of wood not less than 1-inch (25 mm) nominal thickness or of wood structural panels as specified in Table 2308.9.3(3).

1405.18 Polypropylene siding. Polypropylene siding conforming to the requirements of this section and complying with Section 1404.12 shall be limited to exterior walls of Type VB construction located in areas where the wind speed specified in Chapter 16 does not exceed 100 miles per hour (45 m/s) and the building height is less than or equal to 40 feet (12 192 mm) in Exposure C. Where construction is located in areas where the basic wind speed exceeds 100 miles per hour (45 m/s), or building heights are in excess of 40 feet (12 192 mm), tests or calculations indicating compliance with Chapter 16 shall be submitted. Polypropylene siding shall be installed in accordance with the manufacturer's instructions. Polypropylene siding shall be secured to the building so as to provide weather protection for the exterior walls of the building.

SECTION 1406 COMBUSTIBLE MATERIALS ON THE EXTERIOR SIDE OF EXTERIOR WALLS

1406.1 General. Section 1406 shall apply to *exterior wall coverings*; balconies and similar projections; and bay and oriel windows constructed of combustible materials.

1406.2 Combustible exterior wall coverings. Combustible *exterior wall coverings* shall comply with this section.

Exception: Plastics complying with Chapter 26.

1406.2.1 Type I, II, III and IV construction. On buildings of Type I, II, III and IV construction, exterior wall coverings shall be permitted to be constructed of combustible materials, complying with the following limitations:

1. Combustible exterior wall coverings shall not exceed 10 percent of an exterior wall surface area where the fire separation distance is 5 feet (1524 mm) or less.
2. Combustible exterior wall coverings shall be limited to 40 feet (12 192 mm) in height above grade plane.
3. Combustible exterior wall coverings constructed of fire-retardant-treated wood complying with Section 2303.2 for exterior installation shall not be limited in wall surface area where the fire separation distance is 5 feet (1524 mm) or less and shall be permitted up to 60 feet (18 288 mm) in height above grade plane regardless of the fire separation distance.
4. Wood veneers shall comply with Section 1405.5.

1406.2.1.1 Ignition resistance. Where permitted by Section 1406.2.1, combustible exterior wall coverings shall be tested in accordance with NFPA 268.

Exceptions:

1. Wood or wood-based products.
2. Other combustible materials covered with an exterior weather covering, other than vinyl sidings, included in and complying with the thickness requirements of Table 1405.2.
3. Aluminum having a minimum thickness of 0.019 inch (0.48 mm).

1406.2.1.1.1 Fire separation 5 feet or less. Where installed on exterior walls having a fire separation distance of 5 feet (1524 mm) or less, combustible exterior wall coverings shall not exhibit sustained flaming as defined in NFPA 268.

1406.2.1.1.2 Fire separation greater than 5 feet. For fire separation distances greater than 5 feet (1524 mm), any exterior wall covering shall be permitted that has been exposed to a reduced level of incident radiant heat flux in accordance with the

NFPA 268 test method without exhibiting sustained flaming. The minimum fire separation distance required for the exterior wall covering shall be determined from Table 1406.2.1.1.2 based on the maximum tolerable level of incident radiant heat flux that does not cause sustained flaming of the exterior wall covering.

**TABLE 1406.2.1.1.2
MINIMUM FIRE SEPARATION FOR
COMBUSTIBLE EXTERIOR WALL COVERINGS**

| FIRE SEPARATION DISTANCE (feet) | TOLERABLE LEVEL INCIDENT RADIANT HEAT ENERGY (kW/m ²) | FIRE SEPARATION DISTANCE (feet) | TOLERABLE LEVEL INCIDENT RADIANT HEAT ENERGY (kW/m ²) |
|---------------------------------|---|---------------------------------|---|
| 5 | 12.5 | 16 | 5.9 |
| 6 | 11.8 | 17 | 5.5 |
| 7 | 11.0 | 18 | 5.2 |
| 8 | 10.3 | 19 | 4.9 |
| 9 | 9.6 | 20 | 4.6 |
| 10 | 8.9 | 21 | 4.4 |
| 11 | 8.3 | 22 | 4.1 |
| 12 | 7.7 | 23 | 3.9 |
| 13 | 7.2 | 24 | 3.7 |
| 14 | 6.7 | 25 | 3.5 |
| 15 | 6.3 | | |

For SI: 1 foot = 304.8 mm, 1 Btu/H² × °F = 0.0057 kW/m² × K.

1406.2.2 Location. Combustible exterior wall coverings located along the top of exterior walls shall be completely backed up by the exterior wall and shall not extend over or above the top of the exterior wall.

1406.2.3 Fireblocking. Where the combustible exterior wall covering is furred out from the exterior wall and forms a solid surface, the distance between the back of the exterior wall covering and the exterior wall shall not exceed 1⁵/₈ inches (41 mm). The concealed space thereby created shall be fireblocked in accordance with Section 718.

Exception: The distance between the back of the exterior wall covering and the exterior wall shall be permitted to exceed 1⁵/₈ inches (41 mm) where the concealed space is not required to be fireblocked by Section 718.

1406.3 Balconies and similar projections. Balconies and similar projections of combustible construction other than fire-retardant-treated wood shall be fire-resistance rated where required by Table 601 for floor construction or shall be of Type IV construction in accordance with Section 602.4. The aggregate length of the projections shall not exceed 50 percent of the building's perimeter on each floor.

Exceptions:

1. On buildings of Type I and II construction, three stories or less above *grade plane*, *fire-retardant-treated wood* shall be permitted for balconies, porches, decks and exterior stairways not used as required exits.

2. Untreated wood is permitted for pickets and rails or similar guardrail devices that are limited to 42 inches (1067 mm) in height.
3. Balconies and similar projections on buildings of Type III, IV and V construction shall be permitted to be of Type V construction, and shall not be required to have a *fire-resistance rating* where sprinkler protection is extended to these areas.
4. Where sprinkler protection is extended to the balcony areas, the aggregate length of the balcony on each floor shall not be limited.

1406.4 Bay and oriel windows. Bay and oriel windows shall conform to the type of construction required for the building to which they are attached.

Exception: *Fire-retardant-treated wood* shall be permitted on buildings three stories or less above grade plane of Type I, II, III or IV construction.

SECTION 1407 METAL COMPOSITE MATERIALS (MCM)

1407.1 General. The provisions of this section shall govern the materials, construction and quality of metal composite materials (MCM) for use as *exterior wall coverings* in addition to other applicable requirements of Chapters 14 and 16.

1407.2 Exterior wall finish. MCM used as *exterior wall* finish or as elements of balconies and similar projections and bay and oriel windows to provide cladding or weather resistance shall comply with Sections 1407.4 through 1407.14.

1407.3 Architectural trim and embellishments. MCM used as architectural *trim* or embellishments shall comply with Sections 1407.7 through 1407.14.

1407.4 Structural design. MCM systems shall be designed and constructed to resist wind loads as required by Chapter 16 for components and cladding.

1407.5 Approval. Results of *approved* tests or an engineering analysis shall be submitted to the *building official* to verify compliance with the requirements of Chapter 16 for wind loads.

1407.6 Weather resistance. MCM systems shall comply with Section 1403 and shall be designed and constructed to resist wind and rain in accordance with this section and the manufacturer's installation instructions.

1407.7 Durability. MCM systems shall be constructed of *approved* materials that maintain the performance characteristics required in Section 1407 for the duration of use.

1407.8 Fire-resistance rating. Where MCM systems are used on exterior walls required to have a *fire-resistance rating* in accordance with Section 705, evidence shall be submitted to the *building official* that the required *fire-resistance rating* is maintained.

Exception: MCM systems not containing foam plastic insulation, which are installed on the outer surface of a fire-resistance-rated *exterior wall* in a manner such that the attachments do not penetrate through the entire *exte-*

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rior wall assembly, shall not be required to comply with this section.

1407.9 Surface-burning characteristics. Unless otherwise specified, MCM shall have a *flame spread index* of 75 or less and a smoke-developed index of 450 or less when tested in the maximum thickness intended for use in accordance with ASTM E84 or UL 723.

1407.10 Type I, II, III and IV construction. Where installed on buildings of Type I, II, III and IV construction, MCM systems shall comply with Sections 1407.10.1 through 1407.10.4, or Section 1407.11.

1407.10.1 Surface-burning characteristics. MCM shall have a *flame spread index* of not more than 25 and a smoke-developed index of not more than 450 when tested as an assembly in the maximum thickness intended for use in accordance with ASTM E84 or UL 723.

1407.10.2 Thermal barriers. MCM shall be separated from the interior of a building by an approved thermal barrier consisting of $\frac{1}{2}$ -inch (12.7 mm) gypsum wallboard or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275.

1407.10.3 Thermal barrier not required. The thermal barrier specified for MCM in Section 1407.10.2 is not required where:

1. The MCM system is specifically approved based on tests conducted in accordance with NFPA 286 and with the acceptance criteria of Section 803.1.2.1, UL 1040 or UL 1715. Such testing shall be performed with the MCM in the maximum thickness intended for use. The MCM system shall include seams, joints and other typical details used in the installation and shall be tested in the manner intended for use.
2. The MCM is used as elements of balconies and similar projections, architectural *trim* or embellishments.

1407.10.4 Full-scale tests. The MCM system shall be tested in accordance with, and comply with, the acceptance criteria of NFPA 285. Such testing shall be performed on the MCM system with the MCM in the maximum thickness intended for use.

1407.11 Alternate conditions. MCM and MCM systems shall not be required to comply with Sections 1407.10.1 through 1407.10.4 provided such systems comply with Section 1407.11.1, 1407.11.2, 1407.11.3 or 1407.11.4.

1407.11.1 Installations up to 40 feet in height. MCM shall not be installed more than 40 feet (12 190 mm) in height above grade where installed in accordance with Sections 1407.11.1.1 and 1407.11.1.2.

1407.11.1.1 Fire separation distance of 5 feet or less. Where the *fire separation distance* is 5 feet (1524 mm) or less, the area of MCM shall not exceed 10 percent of the *exterior wall* surface.

1407.11.1.2 Fire separation distance greater than 5 feet. Where the *fire separation distance* is greater than

5 feet (1524 mm), there shall be no limit on the area of *exterior wall* surface coverage using MCM.

1407.11.2 Installations up to 50 feet in height. MCM shall not be installed more than 50 feet (15 240 mm) in height above grade where installed in accordance with Sections 1407.11.2.1 and 1407.11.2.2.

1407.11.2.1 Self-ignition temperature. MCM shall have a self-ignition temperature of 650°F (343°C) or greater when tested in accordance with ASTM D1929.

1407.11.2.2 Limitations. Sections of MCM shall not exceed 300 square feet (27.9 m²) in area and shall be separated by not less than 4 feet (1219 mm) vertically.

1407.11.3 Installations up to 75 feet in height (Option 1). MCM shall not be installed more than 75 feet (22 860 mm) in height above grade plane where installed in accordance with Sections 1407.11.3.1 through 1407.11.3.5.

Exception: Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 shall be exempt from the height limitation.

1407.11.3.1 Prohibited occupancies. MCM shall not be permitted on buildings classified as Group A-1, A-2, H, I-2 or I-3 occupancies.

1407.11.3.2 Nonfire-resistance-rated exterior walls. MCM shall not be permitted on exterior walls required to have a *fire-resistance rating* by other provisions of this code.

1407.11.3.3 Specifications. MCM shall be required to comply with all of the following:

1. MCM shall have a self-ignition temperature of 650°F (343°C) or greater when tested in accordance with ASTM D1929.
2. MCM shall conform to one of the following combustibility classifications when tested in accordance with ASTM D635:

Class CC1: Materials that have a burning extent of 1 inch (25 mm) or less when tested at a nominal thickness of 0.060 inch (1.5 mm) or in the thickness intended for use.

Class CC2: Materials that have a burning rate of $2\frac{1}{2}$ inches per minute (1.06 mm/s) or less when tested at a nominal thickness of 0.060 inch (1.5 mm) or in the thickness intended for use.

1407.11.3.4 Area limitation and separation. The maximum area of a single MCM panel and the minimum vertical and horizontal separation requirements for MCM panels shall be as provided for in Table 1407.11.3.4. The maximum percentage of exterior wall area of any story covered with MCM panels shall not exceed that indicated in Table 1407.11.3.4 or the percentage of unprotected openings permitted by Section 705.8, whichever is smaller.

Exception: In buildings provided with flame barriers complying with Section 705.8.5 and extending 30 inches (760 mm) beyond the exterior wall in the

TABLE 1407.11.3.4
AREA LIMITATION AND SEPARATION REQUIREMENTS FOR MCM PANELS

| FIRE SEPARATION DISTANCE (feet) | COMBUSTIBILITY CLASS OF MCM | MAXIMUM PERCENTAGE AREA OF EXTERIOR WALL COVERED WITH MCM PANELS | MAXIMUM SINGLE AREA OF MCM PANELS (square feet) | MINIMUM SEPARATION OF MCM PANELS (feet) | |
|--|--------------------------------|---|---|---|------------|
| | | | | Vertical | Horizontal |
| Less than 6 | — | Not Permitted | Not Permitted | — | — |
| 6 or more but less than 11 | CC1 | 10 | 50 | 8 | 4 |
| | CC2 | Not Permitted | Not Permitted | — | — |
| 11 or more but less than or equal to 30 | CC1 | 25 | 90 | 6 | 4 |
| | CC2 | 15 | 70 | 8 | 4 |
| More than 30 | CC1 | 50 | Not Limited | 3 ^a | 0 |
| | CC2 | 50 | 100 | 6 ^a | 3 |

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m².

a. For reductions in the minimum vertical separation, see Section 1407.11.3.4.

plane of the floor, a vertical separation shall not be required at the floor other than that provided by the vertical thickness of the flame barrier.

1407.11.3.5 Automatic sprinkler system increases.

Where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, the maximum percentage area of exterior wall of any story covered with MCM panels and the maximum square footage of a single area of MCM panels in Table 1407.11.3.4 shall be increased 100 percent. The area of MCM panels shall not exceed 50 percent of the exterior wall area of any story or the area permitted by Section 704.8 for unprotected openings, whichever is smaller.

1407.11.4 Installations up to 75 feet in height (Option 2). MCM shall not be installed more than 75 feet (22 860 mm) in height above grade plane where installed in accordance with Sections 1407.11.4.1 through 1407.11.4.4.

Exception: Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 shall be exempt from the height limitation.

1407.11.4.1 Minimum fire separation distance.

MCM shall not be installed on any wall with a fire separation distance less than 30 feet (9 144 mm).

Exception: Where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, the fire separation distance shall be permitted to be reduced to not less than 20 feet (6096 mm).

1407.11.4.2 Specifications. MCM shall be required to comply with all of the following:

1. MCM shall have a self-ignition temperature of 650°F (343°C) or greater when tested in accordance with ASTM D1929.
2. MCM shall conform to one of the following combustibility classifications when tested in accordance with ASTM D635:

Class CC1: Materials that have a burning extent of 1 inch (25 mm) or less when tested at a nominal thickness of 0.060 inch (1.5 mm), or in the thickness intended for use.

Class CC2: Materials that have a burning rate of 2¹/₂ inches per minute (1.06 mm/s) or less when tested at a nominal thickness of 0.060 inch (1.5 mm), or in the thickness intended for use.

1407.11.4.3 Area and size limitations. The aggregate area of MCM panels shall not exceed 25 percent of the area of any exterior wall face of the story on which those panels are installed. The area of a single MCM panel installed above the first story above grade plane shall not exceed 16 square feet (1.5 m²) and the vertical dimension of a single MCM panel shall not exceed 4 feet (1219 mm).

Exception: Where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, the maximum aggregate area of MCM panels shall be increased to 50 percent of the exterior wall face of the story on which those panels are installed and there shall not be a limit on the maximum dimension or area of a single MCM panel.

1407.11.4.4 Vertical separations. Flame barriers complying with Section 705.8 and extending 30 inches (762 mm) beyond the exterior wall or a vertical separation of not less than 4 feet (1219 mm) in height shall be provided to separate MCM panels located on the exterior walls at one-story intervals.

Exception: Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

1407.12 Type V construction. MCM shall be permitted to be installed on buildings of Type V construction.

EXTERIOR WALLS

1407.13 Foam plastic insulation. MCM systems containing foam plastic insulation shall also comply with the requirements of Section 2603.

1407.14 Labeling. MCM shall be labeled in accordance with Section 1703.5.

SECTION 1408 EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS)

1408.1 General. The provisions of this section shall govern the materials, construction and quality of exterior insulation and finish systems (EIFS) for use as *exterior wall coverings* in addition to other applicable requirements of Chapters 7, 14, 16, 17 and 26.

1408.2 Performance characteristics. EIFS shall be constructed such that it meets the performance characteristics required in ASTM E2568.

1408.3 Structural design. The underlying structural framing and substrate shall be designed and constructed to resist loads as required by Chapter 16.

1408.4 Weather resistance. EIFS shall comply with Section 1403 and shall be designed and constructed to resist wind and rain in accordance with this section and the manufacturer's application instructions.

1408.4.1 EIFS with drainage. EIFS with drainage shall have an average minimum drainage efficiency of 90 percent when tested in accordance the requirements of ASTM E2273 and is required on framed walls of Type V construction, Group R1, R2, R3 and R4 occupancies.

1408.4.1.1 Water-resistive barrier. For EIFS with drainage, the *water-resistive barrier* shall comply with Section 1404.2 or ASTM E2570.

1408.5 Installation. Installation of the EIFS and EIFS with drainage shall be in accordance with the EIFS manufacturer's instructions.

1408.6 Special inspections. EIFS installations shall comply with the provisions of Sections 1704.2 and 1705.16.

SECTION 1409 HIGH-PRESSURE DECORATIVE EXTERIOR-GRADE COMPACT LAMINATES (HPL)

1409.1 General. The provisions of this section shall govern the materials, construction and quality of High-Pressure Decorative Exterior-Grade Compact Laminates (HPL) for use as exterior wall coverings in addition to other applicable requirements of Chapters 14 and 16.

1409.2 Exterior wall finish. HPL used as exterior wall covering or as elements of balconies and similar projections and bay and oriel windows to provide cladding or weather resistance shall comply with Sections 1409.4 and 1409.14.

1409.3 Architectural trim and embellishments. HPL used as architectural trim or embellishments shall comply with Sections 1409.7 through 1409.14.

1409.4 Structural design. HPL systems shall be designed and constructed to resist wind loads as required by Chapter 16 for components and cladding.

1409.5 Approval. Results of approved tests or an engineering analysis shall be submitted to the building official to verify compliance with the requirements of Chapter 16 for wind loads.

1409.6 Weather resistance. HPL systems shall comply with Section 1403 and shall be designed and constructed to resist wind and rain in accordance with this section and the manufacturer's instructions.

1409.7 Durability. HPL systems shall be constructed of approved materials that maintain the performance characteristics required in Section 1409 for the duration of use.

1409.8 Fire-resistance rating. Where HPL systems are used on exterior walls required to have a *fire-resistance rating* in accordance with Section 705, evidence shall be submitted to the building official that the required *fire-resistance rating* is maintained.

Exception: HPL systems not containing foam plastic insulation, which are installed on the outer surface of a fire-resistance-rated exterior wall in a manner such that the attachments do not penetrate through the entire exterior wall assembly, shall not be required to comply with this section.

1409.9 Surface-burning characteristics. Unless otherwise specified, HPL shall have a flame spread index of 75 or less and a smoke-developed index of 450 or less when tested in the minimum and maximum thicknesses intended for use in accordance with ASTM E84 or UL 723.

1409.10 Type I, II, III and IV construction. Where installed on buildings of Type I, II, III and IV construction, HPL systems shall comply with Sections 1409.10.1 through 1409.10.4, or Section 1409.11.

1409.10.1 Surface-burning characteristics. HPL shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in the minimum and maximum thicknesses intended for use in accordance with ASTM E84 or UL 723.

1409.10.2 Thermal barriers. HPL shall be separated from the interior of a building by an approved thermal barrier consisting of 1/2-inch (12.7 mm) gypsum wallboard or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275.

1409.10.3 Thermal barrier not required. The thermal barrier specified for HPL in Section 1409.10.2 is not required where:

1. The HPL system is specifically approved based on tests conducted in accordance with UL 1040 or UL 1715. Such testing shall be performed with the HPL in the minimum and maximum thicknesses intended for use. The HPL system shall include seams, joints and other typical details used in the installation and shall be tested in the manner intended for use.

2. The HPL is used as elements of balconies and similar projections, architectural *trim* or embellishments.

1409.10.4 Full-scale tests. The HPL system shall be tested in accordance with, and comply with, the acceptance criteria of NFPA 285. Such testing shall be performed on the HPL system with the HPL in the minimum and maximum thicknesses intended for use.

1409.11 Alternate conditions. HPL and HPL systems shall not be required to comply with Sections 1409.10.1 through 1409.10.4 provided such systems comply with Section 1409.11.1 or 1409.11.2.

1409.11.1 Installations up to 40 feet in height. HPL shall not be installed more than 40 feet (12 190 mm) in height above grade plane where installed in accordance with Sections 1409.11.1.1 and 1409.11.1.2.

1409.11.1.1 Fire separation distance of 5 feet or less. Where the fire separation distance is 5 feet (1524 mm) or less, the area of HPL shall not exceed 10 percent of the exterior wall surface.

1409.11.1.2 Fire separation distance greater than 5 feet. Where the fire separation distance is greater than 5 feet (1524 mm), there shall be no limit on the area of exterior wall surface coverage using HPL.

1409.11.2 Installations up to 50 feet in height. HPL shall not be installed more than 50 feet (15 240 mm) in height above grade plane where installed in accordance with Sections 1409.11.2.1 and 1409.11.2.2.

1409.11.2.1 Self-ignition temperature. HPL shall have a self-ignition temperature of 650°F (343°C) or greater when tested in accordance with ASTM D1929.

1409.11.2.2 Limitations. Sections of HPL shall not exceed 300 square feet (27.9 m²) in area and shall be separated by a minimum 4 feet (1219 mm) vertically.

1409.12 Type V construction. HPL shall be permitted to be installed on buildings of Type V construction.

1409.13 Foam plastic insulation. HPL systems containing foam plastic insulation shall also comply with the requirements of Section 2603.

1409.14 Labeling. HPL shall be labeled in accordance with Section 1703.5.

SECTION 1410 PLASTIC COMPOSITE DECKING

1410.1 Plastic composite decking. Exterior deck boards, stair treads, handrails and guard systems constructed of plastic composites, including plastic lumber, shall comply with Section 2612.

CHAPTER 15

ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

SECTION 1501 GENERAL

1501.1 Scope. The provisions of this chapter shall govern the design, materials, construction and quality of roof assemblies, and rooftop structures.

SECTION 1502 DEFINITIONS

1502.1 Definitions. The following terms are defined in Chapter 2:

AGGREGATE.

BALLAST.

BUILDING-INTEGRATED PHOTOVOLTAIC (BIPV) PRODUCT.

BUILT-UP ROOF COVERING.

INTERLAYMENT.

MECHANICAL EQUIPMENT SCREEN.

METAL ROOF PANEL.

METAL ROOF SHINGLE.

MODIFIED BITUMEN ROOF COVERING.

PENTHOUSE.

PHOTOVOLTAIC MODULE.

PHOTOVOLTAIC PANEL.

PHOTOVOLTAIC PANEL SYSTEM.

PHOTOVOLTAIC SHINGLES.

POSITIVE ROOF DRAINAGE.

RADIANT BARRIER.

REROOFING.

ROOF ASSEMBLY.

ROOF COVERING.

ROOF COVERING SYSTEM.

ROOF DECK.

ROOF RECOVER.

ROOF REPAIR.

ROOF REPLACEMENT.

ROOF VENTILATION.

ROOFTOP STRUCTURE.

SCUPPER.

SINGLE-PLY MEMBRANE.

UNDERLAYMENT.

VEGETATIVE ROOF.

SECTION 1503 WEATHER PROTECTION

1503.1 General. Roof decks shall be covered with *approved* roof coverings secured to the building or structure in accordance with the provisions of this chapter. Roof coverings shall be designed and installed in accordance with this code and the *approved* manufacturer's instructions such that the roof covering shall serve to protect the building or structure.

1503.2 Flashing. Flashing shall be installed in such a manner so as to prevent moisture entering the wall and roof through joints in copings, through moisture-permeable materials and at intersections with parapet walls and other penetrations through the roof plane.

1503.2.1 Locations. Flashing shall be installed at wall and roof intersections, at gutters, wherever there is a change in roof slope or direction and around roof openings. Where flashing is of metal, the metal shall be corrosion resistant with a thickness of not less than 0.019 inch (0.483 mm) (No. 26 galvanized sheet).

1503.3 Coping. Parapet walls shall be properly coped with noncombustible, weatherproof materials of a width no less than the thickness of the parapet wall.

1503.4 Roof drainage. Design and installation of roof drainage systems shall comply with Section 1503 of this code and Sections 1106 and 1108, as applicable, of the *Plumbing Code*.

1503.4.1 Secondary (emergency overflow) drains or scuppers. Where roof drains are required, secondary (emergency overflow) roof drains or scuppers shall be provided where the roof perimeter construction extends above the roof in such a manner that water will be entrapped if the primary drains allow buildup for any reason. The installation and sizing of secondary emergency overflow drains, leaders and conductors shall comply with Sections 1106 and 1108, as applicable, of the *Plumbing Code*.

1503.4.2 Scuppers. When scuppers are used for secondary (emergency overflow) roof drainage, the quantity, size, location and inlet elevation of the scuppers shall be sized to prevent the depth of ponding water from exceeding that for which the roof was designed as determined by Section 1611.1. Scuppers shall not have an opening dimension of less than 4 inches (102 mm). The flow through the primary system shall not be considered when locating and sizing scuppers.

1503.4.3 Gutters. Gutters and leaders placed on the outside of buildings, other than Group R-3, private garages and buildings of Type V construction, shall be of noncombustible material or a minimum of Schedule 40 plastic pipe.

1503.5 Attic and rafter ventilation. Intake and exhaust vents shall be provided in accordance with Section 1203.2 and the vent product manufacturer's installation instructions.

1503.6 Crickets and saddles. A cricket or saddle shall be installed on the ridge side of any chimney or penetration greater than 30 inches (762 mm) wide as measured perpendicular to the slope. Cricket or saddle coverings shall be sheet metal or of the same material as the roof covering.

Exception: Unit skylights installed in accordance with Section 2405.5 and flashed in accordance with the manufacturer's instructions shall be permitted to be installed without a cricket or saddle.

SECTION 1504 PERFORMANCE REQUIREMENTS

1504.1 Wind resistance of roofs. Roof decks and roof coverings shall be designed for wind loads in accordance with Chapter 16 and Sections 1504.2, 1504.3 and 1504.4.

1504.1.1 Wind resistance of asphalt shingles. Asphalt shingles shall be tested in accordance with ASTM D7158. Asphalt shingles shall meet the classification requirements of Table 1504.1.1 for the appropriate maximum basic wind speed. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D7158 and the required classification in Table 1504.1.1.

Exception: Asphalt shingles that are not included in the scope of ASTM D7158 shall be tested and labeled to indicate compliance with ASTM D3161 and the required classification in Table 1504.1.1.

1504.2 Wind resistance of clay and concrete tile. Wind loads on clay and concrete tile roof coverings shall be in accordance with Section 1609.5.

1504.2.1 Testing. Testing of concrete and clay roof tiles shall be in accordance with Sections 1504.2.1.1 and 1504.2.1.2.

1504.2.1.1 Overturning resistance. Concrete and clay roof tiles shall be tested to determine their resistance to overturning due to wind in accordance with SBCCI SSTD 11 and Chapter 15.

1504.2.1.2 Wind tunnel testing. Where concrete and clay roof tiles do not satisfy the limitations in Chapter

16 for rigid tile, a wind tunnel test shall be used to determine the wind characteristics of the concrete or clay tile roof covering in accordance with SBCCI SSTD 11 and Chapter 15.

1504.3 Wind resistance of nonballasted roofs. Roof coverings installed on roofs in accordance with Section 1507 that are mechanically attached or adhered to the roof deck shall be designed to resist the design wind load pressures for components and cladding in accordance with Section 1609.

1504.3.1 Other roof systems. Built-up, modified bitumen, fully adhered or mechanically attached single-ply roof systems, metal panel roof systems applied to a solid or closely fitted deck and other types of membrane roof coverings shall be tested in accordance with FM 4474, UL 580 or UL 1897.

1504.3.2 Structural metal panel roof systems. Where the metal roof panel functions as the roof deck and roof covering and it provides both weather protection and support for loads, the structural metal panel roof system shall comply with this section. Structural standing-seam metal panel roof systems shall be tested in accordance with ASTM E1592 or FM 4474. Structural through-fastened metal panel roof systems shall be tested in accordance with FM 4474, UL 580 or ASTM E1592.

Exceptions:

1. Metal roofs constructed of cold-formed steel shall be permitted to be designed and tested in accordance with the applicable referenced structural design standard in Section 2210.1.
2. Metal roofs constructed of aluminum shall be permitted to be designed and tested in accordance with the applicable referenced structural design standard in Section 2002.1.

1504.4 Ballasted low-slope roof systems. Ballasted low-slope (roof slope < 2:12) single-ply roof system coverings installed in accordance with Sections 1507.12 and 1507.13, and protected membrane ballasted low-slope (roof slope < 2:12) hot-applied rubberized-asphalt roofing systems installed in accordance with Section 1507.18, shall be designed in accordance with Section 1504.8 and ANSI/SPRI RP-4.

TABLE 1504.1.1
CLASSIFICATION OF ASPHALT SHINGLES

| MAXIMUM BASIC WIND SPEED, V_{ult} FROM FIGURE 1609.3(1), 1609.3(2), 1609.3(3) OR ASCE 7 | MAXIMUM BASIC WIND SPEED, V_{asph} FROM TABLE 1609.3.1 | ASTM D7158 ^a CLASSIFICATION | ASTM D3161 CLASSIFICATION |
|---|---|--|---------------------------|
| 110 | 85 | D, G or H | A, D or F |
| 116 | 90 | D, G or H | A, D or F |
| 129 | 100 | G or H | A, D or F |
| 142 | 110 | G or H | F |
| 155 | 120 | G or H | F |
| 168 | 130 | H | F |
| 181 | 140 | H | F |
| 194 | 150 | H | F |

For SI: 1 foot = 304.8 mm; 1 mph = 0.447 m/s.

a. The standard calculations contained in ASTM D7158 assume Exposure Category B or C and building height of 60 feet or less. Additional calculations are required for conditions outside of these assumptions.

1504.5 Edge securement for low-slope roofs. Low-slope built-up, modified bitumen and single-ply roof system metal edge securement, except gutters, shall be designed and installed for wind loads in accordance with Chapter 16 and tested for resistance in accordance with Test Methods RE-1, RE-2 and RE-3 of ANSI/SPRI ES-1, except V_{ult} wind speed shall be determined from Figure 1609.3(1), 1609.3(2) or 1609.3(3) as applicable.

1504.6 Physical properties. Roof coverings installed on low-slope roofs (roof slope < 2:12) in accordance with Section 1507 shall demonstrate physical integrity over the working life of the roof based upon 2,000 hours of exposure to accelerated weathering tests conducted in accordance with ASTM G152, ASTM G155 or ASTM G154. Those roof coverings that are subject to cyclical flexural response due to wind loads shall not demonstrate any significant loss of tensile strength for unreinforced membranes or breaking strength for reinforced membranes when tested as herein required.

1504.7 Impact resistance. Roof coverings installed on low-slope roofs (roof slope < 2:12) in accordance with Section 1507 shall resist impact damage based on the results of tests conducted in accordance with ASTM D3746, ASTM D4272, CGSB 37-GP-52M or the "Resistance to Foot Traffic Test" in Section 5.5 of FM 4470.

1504.8 Aggregate. Aggregate used as surfacing for roof coverings and aggregate, gravel or stone used as ballast shall not be used on the roof of a building located in a hurricane-prone region as defined in Section 202, or on any other building with a mean roof height exceeding that permitted by Table 1504.8 based on the exposure category and basic wind speed at the site.

TABLE 1504.8
MAXIMUM ALLOWABLE MEAN ROOF HEIGHT
PERMITTED FOR BUILDINGS WITH AGGREGATE ON THE
ROOF IN AREAS OUTSIDE A HURRICANE-PRONE REGION

| NOMINAL DESIGN WIND SPEED, V_{asf} (mph) ^{b, d} | MAXIMUM MEAN ROOF HEIGHT (ft) ^{a, c} | | |
|---|---|----|----|
| | Exposure category | | |
| | B | C | D |
| 85 | 170 | 60 | 30 |
| 90 | 110 | 35 | 15 |
| 95 | 75 | 20 | NP |
| 100 | 55 | 15 | NP |
| 105 | 40 | NP | NP |
| 110 | 30 | NP | NP |
| 115 | 20 | NP | NP |
| 120 | 15 | NP | NP |
| Greater than 120 | NP | NP | NP |

For SI: 1 foot = 304.8 mm; 1 mile per hour = 0.447 m/s.

a. Mean roof height as defined in ASCE 7.

b. For intermediate values of V_{asf} , the height associated with the next higher value of V_{asf} shall be used, or direct interpolation is permitted.

c. NP = gravel and stone not permitted for any roof height.

d. V_{asf} shall be determined in accordance with Section 1609.3.1.

SECTION 1505 FIRE CLASSIFICATION

1505.1 General. Roof assemblies shall be divided into the classes defined below. Class A, B and C roof assemblies and roof coverings required to be listed by this section shall be tested in accordance with ASTM E108 or UL 790. In addition, *fire-retardant-treated wood* roof coverings shall be tested in accordance with ASTM D2898. The minimum roof coverings installed on buildings shall comply with Table 1505.1 based on the type of construction of the building.

Exception: Skylights and sloped glazing that comply with Chapter 24 or Section 2610.

TABLE 1505.1^{a, b}
MINIMUM ROOF COVERING CLASSIFICATION
FOR TYPES OF CONSTRUCTION

| IA | IB | IIA | IIB | IIIA | IIIB | IV | VA | VB |
|----|----|-----|----------------|------|----------------|----|----|----------------|
| B | B | B | C ^c | B | C ^c | B | B | C ^c |

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m².

a. Unless otherwise required in accordance with the *Wildland-Urban Interface Code* or due to the location of the building within a fire district in accordance with Appendix D.

b. Nonclassified roof coverings shall be permitted on buildings of Group R-3 and Group U occupancies, where there is a minimum fire-separation distance of 6 feet measured from the leading edge of the roof.

c. Buildings that are not more than two stories above grade plane and having not more than 6,000 square feet of projected roof area and where there is a minimum 10-foot fire-separation distance from the leading edge of the roof to a lot line on all sides of the building, except for street fronts or public ways, shall be permitted to have roofs of No. 1 cedar or redwood shakes and No. 1 shingles constructed in accordance with Section 1505.7.

1505.2 Class A roof assemblies. Class A roof assemblies are those that are effective against severe fire test exposure. Class A roof assemblies and roof coverings shall be *listed* and identified as Class A by an *approved* testing agency. Class A roof assemblies shall be permitted for use in buildings or structures of all types of construction.

Exceptions:

- Class A roof assemblies include those with coverings of brick, masonry or an exposed concrete roof deck.
- Class A roof assemblies also include ferrous or copper shingles or sheets, metal sheets and shingles, clay or concrete roof tile or slate installed on non-combustible decks or ferrous, copper or metal sheets installed without a roof deck on noncombustible framing.
- Class A roof assemblies include minimum 16 ounce per square foot (0.0416 kg/m²) copper sheets installed over combustible decks.
- Class A roof assemblies include slate installed over ASTM D226, Type II underlayment over combustible decks.

1505.3 Class B roof assemblies. Class B roof assemblies are those that are effective against moderate fire-test exposure. Class B roof assemblies and roof coverings shall be *listed* and identified as Class B by an *approved* testing agency.

1505.4 Class C roof assemblies. Class C roof assemblies are those that are effective against light fire-test exposure. Class C roof assemblies and roof coverings shall be *listed* and identified as Class C by an *approved* testing agency.

1505.5 Nonclassified roofing. Nonclassified roofing is *approved* material that is not *listed* as a Class A, B or C roof covering.

1505.6 Fire-retardant-treated wood shingles and shakes. *Fire-retardant-treated wood* shakes and shingles shall be treated by impregnation with chemicals by the full-cell vacuum-pressure process, in accordance with AWPAC1. Each bundle shall be marked to identify the manufactured unit and the manufacturer, and shall also be *labeled* to identify the classification of the material in accordance with the testing required in Section 1505.1, the treating company and the quality control agency.

1505.7 Special purpose roofs. Special purpose wood shingle or wood shake roofing shall conform to the grading and application requirements of Section 1507.8 or 1507.9. In addition, an underlayment of $\frac{5}{8}$ -inch (15.9 mm) Type X water-resistant gypsum backing board or gypsum sheathing shall be placed under minimum nominal $\frac{1}{2}$ -inch-thick (12.7 mm) wood structural panel solid sheathing or 1-inch (25 mm) nominal spaced sheathing.

1505.8 Building-integrated photovoltaic products. *Building-integrated photovoltaic products* installed as the roof covering shall be tested, *listed* and *labeled* for fire classification in accordance with Section 1505.1.

1505.9 Photovoltaic panels and modules. Rooftop-mounted *photovoltaic panel systems* shall be tested, *listed* and identified with a fire classification in accordance with UL 1703. The fire classification shall comply with Table 1505.1 based on the type of construction of the building.

1505.10 Roof gardens and landscaped roofs. Roof gardens and landscaped roofs shall comply with Section 1507.16 and shall be installed in accordance with ANSI/SPRI VF-1.

SECTION 1506 MATERIALS

1506.1 Scope. The requirements set forth in this section shall apply to the application of roof-covering materials specified herein. Roof coverings shall be applied in accordance with this chapter and the manufacturer's installation instructions. Installation of roof coverings shall comply with the applicable provisions of Section 1507.

1506.2 Material specifications and physical characteristics. Roof-covering materials shall conform to the applicable standards listed in this chapter.

1506.3 Product identification. Roof-covering materials shall be delivered in packages bearing the manufacturer's identifying marks and *approved* testing agency labels required in accordance with Section 1505. Bulk shipments of materials shall be accompanied with the same information issued in the form of a certificate or on a bill of lading by the manufacturer.

SECTION 1507 REQUIREMENTS FOR ROOF COVERINGS

1507.1 Scope. Roof coverings shall be applied in accordance with the applicable provisions of this section and the manufacturer's installation instructions.

1507.2 Asphalt shingles. The installation of asphalt shingles shall comply with the provisions of this section.

1507.2.1 Deck requirements. Asphalt shingles shall be fastened to solidly sheathed decks.

1507.2.2 Slope. Asphalt shingles shall only be used on roof slopes of two units vertical in 12 units horizontal (17-percent slope) or greater. For roof slopes from two units vertical in 12 units horizontal (17-percent slope) up to four units vertical in 12 units horizontal (33-percent slope), double underlayment application is required in accordance with Section 1507.2.8.

1507.2.3 Underlayment. Unless otherwise noted, required underlayment shall conform to ASTM D226, Type I, ASTM D4869, Type I, or ASTM D6757.

1507.2.4 Self-adhering polymer modified bitumen sheet. Self-adhering polymer modified bitumen sheet shall comply with ASTM D1970.

1507.2.5 Asphalt shingles. Asphalt shingles shall comply with ASTM D225 or ASTM D3462.

1507.2.6 Fasteners. Fasteners for asphalt shingles shall be galvanized, stainless steel, aluminum or copper roofing nails, minimum 12-gage [0.105 inch (2.67 mm)] shank with a minimum $\frac{3}{8}$ -inch-diameter (9.5 mm) head, of a length to penetrate through the roofing materials and a minimum of $\frac{3}{4}$ inch (19.1 mm) into the roof sheathing. Where the roof sheathing is less than $\frac{3}{4}$ inch (19.1 mm) thick, the nails shall penetrate through the sheathing. Fasteners shall comply with ASTM F1667.

1507.2.7 Attachment. Asphalt shingles shall have the minimum number of fasteners required by the manufacturer, but not less than four fasteners per strip shingle or two fasteners per individual shingle. Where the roof slope exceeds 21 units vertical in 12 units horizontal (21:12), shingles shall be installed as required by the manufacturer.

1507.2.8 Underlayment application. For roof slopes from two units vertical in 12 units horizontal (17-percent slope) and up to four units vertical in 12 units horizontal (33-percent slope), underlayment shall be two layers applied in the following manner. Apply a minimum 19-inch-wide (483 mm) strip of underlayment felt parallel with and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inch-wide (914 mm) sheets of underlayment overlapping successive sheets 19 inches (483 mm) and fasten sufficiently to hold in place. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. For roof slopes of four units vertical in 12 units horizontal (33-percent slope) or greater, underlayment shall be one layer applied in the following manner. Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 2 inches (51 mm), fastened sufficiently to hold in place. Distortions in the underlayment shall not interfere with the ability of the shingles to seal.

1507.2.8.1 High wind attachment. Underlayment applied in areas subject to high winds [V_{asd} greater than 110 mph (49 m/s) as determined in accordance with Section 1609.3.1] shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's instructions. Fasteners are to be applied along the overlap not more than 36 inches (914 mm) on center.

Underlayment installed where V_{asd} in accordance with Section 1609.3.1, equals or exceeds 120 mph (54 m/s) shall comply with ASTM D226 Type II, ASTM D4869 Type IV, or ASTM D6757. The underlayment shall be attached in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at the side laps. Underlayment shall be applied in accordance with Section 1507.2.8 except all laps shall be a minimum of 4 inches (102 mm). Underlayment shall be attached using metal or plastic cap nails with a head diameter of not less than 1 inch (25 mm) with a thickness of at least 32-gage [0.0134 inch (0.34 mm)] sheet metal. The cap nail shank shall be a minimum of 12 gage [0.105 inch (2.67 mm)] with a length to penetrate through the roof sheathing or a minimum of $\frac{3}{4}$ inch (19.1 mm) into the roof sheathing.

Exception: As an alternative, adhered underlayment complying with ASTM D1970 shall be permitted.

1507.2.8.2 Ice barrier. In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer modified bitumen sheet shall be used in lieu of normal underlayment and extend from the lowest edges of all roof surfaces to a point at least 24 inches (610 mm) inside the *exterior wall* line of the building.

Exception: Detached accessory structures that contain no conditioned floor area.

1507.2.9 Flashings. Flashing for asphalt shingles shall comply with this section. Flashing shall be applied in accordance with this section and the asphalt shingle manufacturer's printed instructions.

1507.2.9.1 Base and cap flashing. Base and cap flashing shall be installed in accordance with the manufacturer's instructions. Base flashing shall be of either corrosion-resistant metal of minimum nominal 0.019-inch (0.483 mm) thickness or mineral-surfaced roll roofing weighing a minimum of 77 pounds per 100 square feet (3.76 kg/m²). Cap flashing shall be corrosion-resistant metal of minimum nominal 0.019-inch (0.483 mm) thickness.

1507.2.9.2 Valleys. Valley linings shall be installed in accordance with the manufacturer's instructions before applying shingles. Valley linings of the following types shall be permitted:

1. For open valleys (valley lining exposed) lined with metal, the valley lining shall be at least 24 inches (610 mm) wide and of any of the corrosion-resistant metals in Table 1507.2.9.2.

2. For open valleys, valley lining of two plies of mineral-surfaced roll roofing complying with ASTM D3909 or ASTM D6380 shall be permitted. The bottom layer shall be 18 inches (457 mm) and the top layer a minimum of 36 inches (914 mm) wide.
3. For closed valleys (valleys covered with shingles), valley lining of one ply of smooth roll roofing complying with ASTM D6380, and at least 36 inches (914 mm) wide or types as described in Item 1 or 2 above shall be permitted. Self-adhering polymer modified bitumen underlayment complying with ASTM D1970 shall be permitted in lieu of the lining material.

1507.2.9.3 Drip edge. A drip edge shall be provided at eaves and rake edges of shingle roofs. Adjacent segments of the drip edge shall be lapped a minimum of 2 inches (51 mm). The vertical leg of drip edges shall be a minimum of $1\frac{1}{2}$ inches (38 mm) in width and shall extend a minimum of $\frac{1}{4}$ inch (6.4 mm) below sheathing. The drip edge shall extend back on the roof a minimum of 2 inches (51 mm). Underlayment shall be installed over drip edges along eaves. Drip edges shall be installed over underlayment along rake edges. Drip edges shall be mechanically fastened a maximum of 12 inches (305 mm) on center.

1507.3 Clay and concrete tile. The installation of clay and concrete tile shall comply with the provisions of this section.

1507.3.1 Deck requirements. Concrete and clay tile shall be installed only over solid sheathing or spaced structural sheathing boards.

1507.3.2 Deck slope. Clay and concrete roof tile shall be installed on roof slopes of $2\frac{1}{2}$ units vertical in 12 units horizontal (21-percent slope) or greater. For roof slopes from $2\frac{1}{2}$ units vertical in 12 units horizontal (21-percent slope) to four units vertical in 12 units horizontal (33-percent slope), double underlayment application is required in accordance with Section 1507.3.3.

1507.3.3 Underlayment. Unless otherwise noted, required underlayment shall conform to: ASTM D226, Type II; ASTM D2626 or ASTM D6380, Class M mineral-surfaced roll roofing.

1507.3.3.1 Low-slope roofs. For roof slopes from $2\frac{1}{2}$ units vertical in 12 units horizontal (21-percent slope), up to four units vertical in 12 units horizontal (33-percent slope), underlayment shall be a minimum of two layers applied as follows:

1. Starting at the eave, a 19-inch (483 mm) strip of underlayment shall be applied parallel with the eave and fastened sufficiently in place.
2. Starting at the eave, 36-inch-wide (914 mm) strips of underlayment felt shall be applied overlapping successive sheets 19 inches (483 mm) and fastened sufficiently in place.

1507.3.3.2 High-slope roofs. For roof slopes of four units vertical in 12 units horizontal (33-percent slope) or greater, underlayment shall be a minimum of one

**TABLE 1507.2.9.2
VALLEY LINING MATERIAL**

| MATERIAL | MINIMUM THICKNESS | GAGE | WEIGHT |
|-------------------------------|-------------------|----------------------|----------------------------------|
| Aluminum | 0.024 in. | — | — |
| Cold-rolled copper | 0.0216 in. | — | ASTM B370, 16 oz. per square ft. |
| Copper | — | — | 16 oz |
| Galvanized steel | 0.0179 in. | 26 (zinc-coated G90) | — |
| High-yield copper | 0.0162 in. | — | ASTM B370, 12 oz. per square ft. |
| Lead | — | — | 2.5 pounds |
| Lead-coated copper | 0.0216 in. | — | ASTM B101, 16 oz. per square ft. |
| Lead-coated high-yield copper | 0.0162 in. | — | ASTM B101, 12 oz. per square ft. |
| Painted terne | — | — | 20 pounds |
| Stainless steel | — | 28 | — |
| Zinc alloy | 0.027 in. | — | — |

For SI: 1 inch = 25.4 mm, 1 pound = 0.454 kg, 1 ounce = 28.35 g, 1 square foot = 0.0929 m².

layer of underlayment felt applied shingle fashion, parallel to, and starting from the eaves and lapped 2 inches (51 mm), fastened only as necessary to hold in place.

1507.3.3.3 High wind attachment. Underlayment applied in areas subject to high wind [V_{asd} greater than 110 mph (49 m/s) as determined in accordance with Section 1609.3.1] shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's installation instructions. Fasteners are to be applied along the overlap not more than 36 inches (914 mm) on center.

Underlayment installed where V_{asd} in accordance with Section 1609.3.1, equals or exceeds 120 mph (54 m/s) shall be attached in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at the side laps. Underlayment shall be applied in accordance with Sections 1507.3.3.1 and 1507.3.3.2 except all laps shall be a minimum of 4 inches (102 mm). Underlayment shall be attached using metal or plastic cap nails with a head diameter of not less than 1 inch (25 mm) with a thickness of at least 32-gage [0.0134 inch (0.34 mm)] sheet metal. The cap nail shank shall be a minimum of 12 gage [0.105 inch (2.67 mm)] with a length to penetrate through the roof sheathing or a minimum of $3/4$ inch (19.1 mm) into the roof sheathing.

Exception: As an alternative, adhered underlayment complying with ASTM D1970 shall be permitted.

1507.3.4 Clay tile. Clay roof tile shall comply with ASTM C1167.

1507.3.5 Concrete tile. Concrete roof tile shall comply with ASTM C1492.

1507.3.6 Fasteners. Tile fasteners shall be corrosion resistant and not less than 11-gage, $5/16$ -inch (8.0 mm) head, and of sufficient length to penetrate the deck a minimum of $3/4$ inch (19.1 mm) or through the thickness of the deck, whichever is less. Attaching wire for clay or concrete tile shall not be smaller than 0.083 inch (2.1 mm). Perimeter fastening areas include three tile courses but not less than 36 inches (914 mm) from either side of hips or ridges and edges of eaves and gable rakes.

1507.3.7 Attachment. Clay and concrete roof tiles shall be fastened in accordance with Table 1507.3.7.

1507.3.8 Application. Tile shall be applied according to the manufacturer's installation instructions, based on the following:

1. Climatic conditions.
2. Roof slope.
3. Underlayment system.
4. Type of tile being installed.

1507.3.9 Flashing. At the juncture of the roof vertical surfaces, flashing and counterflashing shall be provided in accordance with the manufacturer's installation instructions, and where of metal, shall not be less than 0.019-inch (0.48 mm) (No. 26 galvanized sheet gage) corrosion-resistant metal. The valley flashing shall extend at least 11 inches (279 mm) from the centerline each way and have a splash diverter rib not less than 1 inch (25 mm) high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 4 inches (102 mm). For roof slopes of three units vertical in 12 units horizontal (25-percent slope) and over, the valley flashing shall have a 36-inch-wide (914 mm) underlayment of either one layer of Type I underlayment running the full length of the valley, or a self-adhering polymer-modified bitumen sheet complying with ASTM D1970, in addition to other required underlayment. In areas where the average daily temperature in January is 25°F (-4°C) or less or where there is a possibility of ice forming along the eaves causing a backup of water, the metal valley flashing underlayment shall be solid cemented to the roofing underlayment for slopes under seven units vertical in 12 units horizontal (58-percent slope) or self-adhering polymer-modified bitumen sheet shall be installed.

1507.4 Metal roof panels. The installation of metal roof panels shall comply with the provisions of this section.

1507.4.1 Deck requirements. Metal roof panel roof coverings shall be applied to a solid or closely fitted deck, except where the roof covering is specifically designed to be applied to spaced supports.

TABLE 1507.3.7
CLAY AND CONCRETE TILE ATTACHMENT^{a, b, c}

| GENERAL - CLAY OR CONCRETE ROOF TILE | | | | |
|---|-------------------------|--|---|--|
| Maximum Nominal Design Wind Speed, V_{asd} ' (mph) | Mean roof height (feet) | Roof slope < 3:12 | Roof slope 3:12 and over | |
| 85 | 0-60 | One fastener per tile. Flat tile without vertical laps, two fasteners per tile. | Two fasteners per tile. Only one fastener on slopes of 7:12 and less for tiles with installed weight exceeding 7.5 lbs./sq. ft. having a width not more than 16 inches. | |
| 100 | 0-40 | | | |
| 100 | >40-60 | The head of all tiles shall be nailed. The nose of all eave tiles shall be fastened with approved clips. All rake tiles shall be nailed with two nails. The nose of all ridge, hip and rake tiles shall be set in a bead of roofer's mastic. | | |
| 110 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.3. | | |
| 120 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.3. | | |
| 130 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.3. | | |
| All | >60 | The fastening system shall resist the wind forces in Section 1609.5.3. | | |
| INTERLOCKING CLAY OR CONCRETE ROOF TILE WITH PROJECTING ANCHOR LUGS ^{d, e} (Installations on spaced/solid sheathing with battens or spaced sheathing) | | | | |
| Maximum Nominal Design Wind Speed, V_{asd} ' (mph) | Mean roof height (feet) | Roof slope < 5:12 | Roof slope 5:12 < 12:12 | Roof slope 12:12 and over |
| 85 | 0-60 | Fasteners are not required. Tiles with installed weight less than 9 lbs./sq. ft. require a minimum of one fastener per tile. | One fastener per tile every other row. All perimeter tiles require one fastener. Tiles with installed weight less than 9 lbs./sq. ft. require a minimum of one fastener per tile. | One fastener required for every tile. Tiles with installed weight less than 9 lbs./sq. ft. require a minimum of one fastener per tile. |
| 100 | 0-40 | | | |
| 100 | >40-60 | The head of all tiles shall be nailed. The nose of all eave tiles shall be fastened with approved clips. All rake tiles shall be nailed with two nails. The nose of all ridge, hip and rake tiles shall be set in a bead of roofer's mastic. | | |
| 110 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.3. | | |
| 120 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.3. | | |
| 130 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.3. | | |
| All | >60 | The fastening system shall resist the wind forces in Section 1609.5.3. | | |
| INTERLOCKING CLAY OR CONCRETE ROOF TILE WITH PROJECTING ANCHOR LUGS (Installations on solid sheathing without battens) | | | | |
| Maximum Nominal Design Wind Speed, V_{asd} '(mph) | Mean roof height (feet) | All roof slopes | | |
| 85 | 0-60 | One fastener per tile. | | |
| 100 | 0-40 | One fastener per tile. | | |
| 100 | > 40-60 | The head of all tiles shall be nailed. The nose of all eave tiles shall be fastened with approved clips. All rake tiles shall be nailed with two nails. The nose of all ridge, hip and rake tiles shall be set in a bead of roofer's mastic. | | |
| 110 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.3. | | |
| 120 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.3. | | |
| 130 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.3. | | |
| All | > 60 | The fastening system shall resist the wind forces in Section 1609.5.3. | | |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 4.882 kg/m².

- Minimum fastener size. Corrosion-resistant nails not less than No. 11 gage with $\frac{5}{16}$ -inch head. Fasteners shall be long enough to penetrate into the sheathing $\frac{3}{4}$ inch or through the thickness of the sheathing, whichever is less. Attaching wire for clay and concrete tile shall not be smaller than 0.083 inch.
- Snow areas. A minimum of two fasteners per tile are required on battens and one fastener.
- Roof slopes greater than 24:12. The nose of all tiles shall be securely fastened.
- Horizontal battens. Battens shall be not less than 1 inch by 2 inch nominal. Provisions shall be made for drainage by a minimum of $\frac{1}{8}$ -inch riser at each nail or by 4-foot-long battens with at least a $\frac{1}{2}$ -inch separation between battens. Horizontal battens are required for slopes over 7:12.
- Perimeter fastening areas include three tile courses but not less than 36 inches from either side of hips or ridges and edges of eaves and gable rakes.
- V_{asd} shall be determined in accordance with Section 1609.3.1.

1507.4.2 Deck slope. Minimum slopes for metal roof panels shall comply with the following:

1. The minimum slope for lapped, nonsoldered seam metal roof panels without applied lap sealant shall be three units vertical in 12 units horizontal (25-percent slope).
2. The minimum slope for lapped, nonsoldered seam metal roof panels with applied lap sealant shall be one-half unit vertical in 12 units horizontal (4-percent slope). Lap sealants shall be applied in accordance with the approved manufacturer's installation instructions.
3. The minimum slope for standing-seam metal roof panel systems shall be one-quarter unit vertical in 12 units horizontal (2-percent slope).

1507.4.3 Material standards. Metal-sheet roof covering systems that incorporate supporting structural members shall be designed in accordance with Chapter 22. Metal-sheet roof coverings installed over structural decking shall comply with Table 1507.4.3(1). The materials used for metal-sheet roof coverings shall be naturally corrosion resistant or provided with corrosion resistance in accordance with the standards and minimum thicknesses shown in Table 1507.4.3(2).

1507.4.4 Attachment. Metal roof panels shall be secured to the supports in accordance with the approved manufacturer's fasteners. In the absence of manufacturer recommendations, the following fasteners shall be used:

1. Galvanized fasteners shall be used for steel roofs.
2. Copper, brass, bronze, copper alloy or 300 series stainless-steel fasteners shall be used for copper roofs.
3. Stainless-steel fasteners are acceptable for all types of metal roofs.
4. Aluminum fasteners are acceptable for aluminum roofs attached to aluminum supports.

1507.4.5 Underlayment and high wind. Underlayment applied in areas subject to high winds [V_{asd} greater than 110 mph (49 m/s) as determined in accordance with Section 1609.3.1] shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's installation instructions. Fasteners are to be applied along the overlap not more than 36 inches (914 mm) on center.

Underlayment installed where V_{asd} in accordance with Section 1609.3.1, equals or exceeds 120 mph (54 m/s) shall comply with ASTM D226 Type II, ASTM D4869 Type IV, or ASTM D1970. The underlayment shall be attached in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at the side laps. Underlayment shall be applied in accordance with the manufacturer's installation instructions except all laps shall be a minimum of 4 inches (102 mm). Underlayment shall be attached using metal or plastic cap nails with a head diameter of not less than 1 inch (25 mm) with a thickness of at least 32-gage [0.0134 inch (0.34 mm)] sheet metal. The cap nail shank shall be a minimum of 12

**TABLE 1507.4.3(1)
METAL ROOF COVERINGS**

| ROOF COVERING TYPE | STANDARD APPLICATION RATE/THICKNESS |
|----------------------------------|--|
| Aluminum | ASTM B209, 0.024 inch minimum thickness for roll-formed panels and 0.019 inch minimum thickness for press-formed shingles. |
| Aluminum-zinc alloy coated steel | ASTM A792 AZ 50 |
| Cold-rolled copper | ASTM B370 minimum 16 oz./sq. ft. and 12 oz./sq. ft. high yield copper for metal-sheet roof covering systems; 12 oz./sq. ft. for preformed metal shingle systems. |
| Copper | 16 oz./sq. ft. for metal-sheet roof-covering systems; 12 oz./sq. ft. for preformed metal shingle systems. |
| Galvanized steel | ASTM A653 G-90 zinc-coated ^a . |
| Hard lead | 2 lbs./sq. ft. |
| Lead-coated copper | ASTM B101 |
| Prepainted steel | ASTM A755 |
| Soft lead | 3 lbs./sq. ft. |
| Stainless steel | ASTM A240, 300 Series Alloys |
| Steel | ASTM A924 |
| Terne and terne-coated stainless | Terne coating of 40 lbs. per double base box, field painted where applicable in accordance with manufacturer's installation instructions. |
| Zinc | 0.027 inch minimum thickness; 99.995% electrolytic high grade zinc with alloy additives of copper (0.08% - 0.20%), titanium (0.07% - 0.12%) and aluminum (0.015%). |

For SI: 1 ounce per square foot = 0.305 kg/m²,
1 pound per square foot = 4.882 kg/m²,
1 inch = 25.4 mm, 1 pound = 0.454 kg.

- a. For Group U buildings, the minimum coating thickness for ASTM A653 galvanized steel roofing shall be G-60.

**TABLE 1507.4.3(2)
MINIMUM CORROSION RESISTANCE**

| | |
|--------------------------------------|------------------------|
| 55% Aluminum-zinc alloy coated steel | ASTM A792 AZ 50 |
| 5% Aluminum alloy-coated steel | ASTM A875 GF60 |
| Aluminum-coated steel | ASTM A463 T2 65 |
| Galvanized steel | ASTM A653 G-90 |
| Prepainted steel | ASTM A755 ^a |

- a. Paint systems in accordance with ASTM A755 shall be applied over steel products with corrosion-resistant coatings complying with ASTM A792, ASTM A875, ASTM A463 or ASTM A653.

gage [0.105 inch (2.67 mm)] with a length to penetrate through the roof sheathing or a minimum of $\frac{3}{4}$ inch (19.1 mm) into the roof sheathing.

Exception: As an alternative, adhered underlayment complying with ASTM D1970 shall be permitted.

1507.5 Metal roof shingles. The installation of metal roof shingles shall comply with the provisions of this section.

1507.5.1 Deck requirements. Metal roof shingles shall be applied to a solid or closely fitted deck, except where the roof covering is specifically designed to be applied to spaced sheathing.

1507.5.2 Deck slope. Metal roof shingles shall not be installed on roof slopes below three units vertical in 12 units horizontal (25-percent slope).

1507.5.3 Underlayment. Underlayment shall comply with ASTM D226, Type I or ASTM D4869.

1507.5.3.1 Underlayment and high wind. Underlayment applied in areas subject to high winds [V_{asd} greater than 110 mph (49 m/s) as determined in accordance with Section 1609.3.1] shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's installation instructions. Fasteners are to be applied along the overlap not farther apart than 36 inches (914 mm) on center.

Underlayment installed where V_{asd} in accordance with Section 1609.3.1, equals or exceeds 120 mph (54 m/s) shall comply with ASTM D226 Type II or ASTM D4869 Type IV. The underlayment shall be attached in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch spacing (152 mm) at the side laps. Underlayment shall be applied in accordance with the manufacturer's installation instructions except all laps shall be a minimum of 4 inches (102 mm). Underlayment shall be attached using metal or plastic cap nails with a head diameter of not less than 1 inch (25 mm) with a thickness of at least 32-gage [0.0134 inch (0.34 mm)] sheet metal. The cap nail shank shall be a minimum of 12 gage [0.105 inch (2.67 mm)] with a length to penetrate through the roof sheathing or a minimum of $\frac{3}{4}$ inch (19.1 mm) into the roof sheathing.

Exception: As an alternative, adhered underlayment complying with ASTM D1970 shall be permitted.

1507.5.4 Ice barrier. In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet shall be used in lieu of normal underlayment and extend from the lowest edges of all roof surfaces to a point at least 24 inches (610 mm) inside the exterior wall line of the building.

Exception: Detached accessory structures that contain no conditioned floor area.

1507.5.5 Material standards. Metal roof shingle roof coverings shall comply with Table 1507.4.3(1). The materials used for metal-roof shingle roof coverings shall be naturally corrosion resistant or provided with corrosion resistance in accordance with the standards and minimum thicknesses specified in the standards listed in Table 1507.4.3(2).

1507.5.6 Attachment. Metal roof shingles shall be secured to the roof in accordance with the *approved* manufacturer's installation instructions.

1507.5.7 Flashing. Roof valley flashing shall be of corrosion-resistant metal of the same material as the roof covering or shall comply with the standards in Table 1507.4.3(1). The valley flashing shall extend at least 8 inches (203 mm) from the centerline each way and shall have a splash diverter rib not less than $\frac{3}{4}$ inch (19.1 mm) high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 4 inches (102 mm). In areas where the average daily temperature in January is 25°F (-4°C) or less or where there is a possibility of ice forming along the eaves causing a backup of water, the metal valley flashing shall have a 36-inch-wide (914 mm) underlayment directly under it consisting of either one layer of underlayment running the full length of the valley or a self-adhering polymer-modified bitumen sheet complying with ASTM D1970, in addition to underlayment required for metal roof shingles. The metal valley flashing underlayment shall be solidly cemented to the roofing underlayment for roof slopes under seven units vertical in 12 units horizontal (58-percent slope) or self-adhering polymer-modified bitumen sheet shall be installed.

1507.6 Mineral-surfaced roll roofing. The installation of mineral-surfaced roll roofing shall comply with this section.

1507.6.1 Deck requirements. Mineral-surfaced roll roofing shall be fastened to solidly sheathed roofs.

1507.6.2 Deck slope. Mineral-surfaced roll roofing shall not be applied on roof slopes below one unit vertical in 12 units horizontal (8-percent slope).

1507.6.3 Underlayment. Underlayment shall comply with ASTM D226, Type I or ASTM D4869.

1507.6.3.1 Underlayment and high wind. Underlayment applied in areas subject to high winds [V_{asd} greater than 110 mph (49 m/s) as determined in accordance with Section 1609.3.1] shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's installation instructions. Fasteners are to be applied along the overlap not more than 36 inches (914 mm) on center.

Underlayment installed where V_{asd} in accordance with Section 1609.3.1, equals or exceeds 120 mph (54 m/s) shall comply with ASTM D226 Type II. The underlayment shall be attached in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at the side laps. Underlayment shall be applied in accordance with the manufacturer's installation instructions except all laps shall be a minimum of 4 inches (102 mm). Underlayment shall be attached using metal or plastic cap nails with a head diameter of not less than 1 inch (25 mm) with a thickness of at least 32-gage [0.0134 inch (0.34 mm)] sheet metal. The cap nail shank shall be a minimum of 12 gage [0.105 inch (2.67 mm)] with a length to penetrate through the roof sheathing or a minimum of $\frac{3}{4}$ inch (19.1 mm) into the roof sheathing.

Exception: As an alternative, adhered underlayment complying with ASTM D1970 shall be permitted.

1507.6.4 Ice barrier. In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet shall be used in lieu of normal underlayment and extend from the lowest edges of all roof surfaces to a point at least 24 inches (610 mm) inside the exterior wall line of the building.

Exception: Detached accessory structures that contain no conditioned floor area.

1507.6.5 Material standards. Mineral-surfaced roll roofing shall conform to ASTM D3909 or ASTM D6380.

1507.7 Slate shingles. The installation of slate shingles shall comply with the provisions of this section.

1507.7.1 Deck requirements. Slate shingles shall be fastened to solidly sheathed roofs.

1507.7.2 Deck slope. Slate shingles shall only be used on slopes of four units vertical in 12 units horizontal (4:12) or greater.

1507.7.3 Underlayment. Underlayment shall comply with ASTM D226, Type II or ASTM D4869, Type III or IV.

1507.7.3.1 Underlayment and high wind. Underlayment applied in areas subject to high winds [V_{asd} greater than 110 mph (49 m/s) as determined in accordance with Section 1609.3.1] shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's installation instructions. Fasteners are to be applied along the overlap not more than 36 inches (914 mm) on center.

Underlayment installed where V_{asd} in accordance with Section 1609.3.1, equals or exceeds 120 mph (54 m/s) shall comply with ASTM D226, Type II or ASTM D4869, Type IV. The underlayment shall be attached in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at the side laps. Underlayment shall be applied in accordance with the manufacturer's installation instructions except all laps shall be a minimum of 4 inches (102 mm). Underlayment shall be attached using metal or plastic cap nails with a head diameter of not less than 1 inch (25 mm) with a thickness of at least 32-gage [0.0134 inch (0.34 mm)] sheet metal. The cap nail shank shall be a minimum of 12 gage [0.105 inch (2.67 mm)] with a length to penetrate through the roof sheathing or a minimum of $\frac{3}{4}$ inch (19.1 mm) into the roof sheathing.

Exception: As an alternative, adhered underlayment complying with ASTM D1970 shall be permitted.

1507.7.4 Ice barrier. In areas where the average daily temperature in January is 25°F (-4°C) or less or where there is a possibility of ice forming along the eaves causing a backup of water, an ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet shall extend from the lowest edges of all roof surfaces to a point

at least 24 inches (610 mm) inside the exterior wall line of the building.

Exception: Detached accessory structures that contain no conditioned floor area.

1507.7.5 Material standards. Slate shingles shall comply with ASTM C406.

1507.7.6 Application. Minimum headlap for slate shingles shall be in accordance with Table 1507.7.6. Slate shingles shall be secured to the roof with two fasteners per slate.

**TABLE 1507.7.6
SLATE SHINGLE HEADLAP**

| SLOPE | HEADLAP (inches) |
|----------------------|---------------------|
| 4:12 < slope < 8:12 | 4 |
| 8:12 < slope < 20:12 | 3 |
| slope ≥ 20:12 | 2 |

For SI: 1 inch = 25.4 mm.

1507.7.7 Flashing. Flashing and counterflashing shall be made with sheet metal. Valley flashing shall be a minimum of 15 inches (381 mm) wide. Valley and flashing metal shall be a minimum uncoated thickness of 0.0179-inch (0.455 mm) zinc-coated G90. Chimneys, stucco or brick walls shall have a minimum of two plies of felt for a cap flashing consisting of a 4-inch-wide (102 mm) strip of felt set in plastic cement and extending 1 inch (25 mm) above the first felt and a top coating of plastic cement. The felt shall extend over the base flashing 2 inches (51 mm).

1507.8 Wood shingles. The installation of wood shingles shall comply with the provisions of this section and Table 1507.8.

1507.8.1 Deck requirements. Wood shingles shall be installed on solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall be not less than 1-inch by 4-inch (25 mm by 102 mm) nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners.

1507.8.1.1 Solid sheathing required. Solid sheathing is required in areas where the average daily temperature in January is 25°F (-4°C) or less or where there is a possibility of ice forming along the eaves causing a backup of water.

1507.8.2 Deck slope. Wood shingles shall be installed on slopes of not less than three units vertical in 12 units horizontal (25-percent slope).

1507.8.3 Underlayment. Underlayment shall comply with ASTM D226, Type I or ASTM D4869.

1507.8.3.1 Underlayment and high wind. Underlayment applied in areas subject to high winds [V_{asd} greater than 110 mph (49 m/s) as determined in accordance with Section 1609.3.1] shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's installation instructions. Fasteners are to be applied along the overlap not more than 36 inches (914 mm) on center.

**TABLE 1507.8
WOOD SHINGLE AND SHAKE INSTALLATION**

| ROOF ITEM | WOOD SHINGLES | WOOD SHAKES |
|---|---|---|
| 1. Roof slope | Wood shingles shall be installed on slopes of not less than three units vertical in 12 units horizontal (3:12). | Wood shakes shall be installed on slopes of not less than four units vertical in 12 units horizontal (4:12). |
| 2. Deck requirement | | |
| Temperate climate | Shingles shall be applied to roofs with solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall be not less than 1" × 4" nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners. | Shakes shall be applied to roofs with solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall be not less than 1" × 4" nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners. When 1" × 4" spaced sheathing is installed at 10 inches, boards must be installed between the sheathing boards. |
| In areas where the average daily temperature in January is 25°F or less or where there is a possibility of ice forming along the eaves causing a backup of water. | Solid sheathing is required. | Solid sheathing is required. |
| 3. Interlayment | No requirements. | Interlayment shall comply with ASTM D226, Type 1. |
| 4. Underlayment | | |
| Temperate climate | Underlayment shall comply with ASTM D226, Type 1. | Underlayment shall comply with ASTM D226, Type 1. |
| In areas where there is a possibility of ice forming along the eaves causing a backup of water. | An ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet shall extend from the eave's edge to a point at least 24 inches inside the exterior wall line of the building. | An ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet shall extend from the lowest edges of all roof surfaces to a point at least 24 inches inside the exterior wall line of the building. |
| 5. Application | | |
| Attachment | Fasteners for wood shingles shall be hot-dipped galvanized or Type 304 (Type 316 for coastal areas) stainless steel with a minimum penetration of 0.75 inch into the sheathing. For sheathing less than 0.5 inch thick, the fasteners shall extend through the sheathing. | Fasteners for wood shakes shall be hot-dipped galvanized or Type 304 (Type 316 for coastal areas) with a minimum penetration of 0.75 inch into the sheathing. For sheathing less than 0.5 inch thick, the fasteners shall extend through the sheathing. |
| No. of fasteners | Two per shingle. | Two per shake. |
| Exposure | Weather exposures shall not exceed those set forth in Table 1507.8.7. | Weather exposures shall not exceed those set forth in Table 1507.9.8. |
| Method | Shingles shall be laid with a side lap of not less than 1.5 inches between joints in courses, and no two joints in any three adjacent courses shall be in direct alignment. Spacing between shingles shall be 0.25 to 0.375 inch. | Shakes shall be laid with a side lap of not less than 1.5 inches between joints in adjacent courses. Spacing between shakes shall not be less than 0.375 inch or more than 0.625 inch for shakes and taper sawn shakes of naturally durable wood and shall be 0.25 to 0.375 inch for preservative-treated taper sawn shakes. |
| Flashing | In accordance with Section 1507.8.8. | In accordance with Section 1507.9.9. |

For SI: 1 inch = 25.4 mm, °C = [(°F) - 32]/1.8.

Underlayment installed where V_{asdp} in accordance with Section 1609.3.1, equals or exceeds 120 mph (54 m/s) shall comply with ASTM D226, Type II or ASTM D4869, Type IV. The underlayment shall be attached in a grid pattern of 12 inches (305 mm) between side

laps with a 6-inch (152 mm) spacing at the side laps. Underlayment shall be applied in accordance with the manufacturer's installation instructions except all laps shall be a minimum of 4 inches (102 mm). Underlayment shall be attached using metal or plastic cap nails

with a head diameter of not less than 1 inch (25 mm) with a thickness of at least 32-gage [0.0134 inch (0.34 mm)] sheet metal. The cap nail shank shall be a minimum of 12 gage [0.105 inch (2.67 mm)] with a length to penetrate through the roof sheathing or a minimum of $\frac{3}{4}$ inch (19.1 mm) into the roof sheathing.

Exception: As an alternative, adhered underlayment complying with ASTM D1970 shall be permitted.

1507.8.4 Ice barrier. In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet shall be used in lieu of normal underlayment and extend from the lowest edges of all roof surfaces to a point at least 24 inches (610 mm) inside the exterior wall line of the building.

Exception: Detached accessory structures that contain no conditioned floor area.

1507.8.5 Material standards. Wood shingles shall be of naturally durable wood and comply with the requirements of Table 1507.8.5.

TABLE 1507.8.5
WOOD SHINGLE MATERIAL REQUIREMENTS

| MATERIAL | APPLICABLE MINIMUM GRADES | GRADING RULES |
|---|---------------------------|---------------|
| Wood shingles of naturally durable wood | 1, 2 or 3 | CSSB |

CSSB = Cedar Shake and Shingle Bureau

1507.8.6 Attachment. Fasteners for wood shingles shall be corrosion resistant with a minimum penetration of $\frac{3}{4}$ inch (19.1 mm) into the sheathing. For sheathing less than $\frac{1}{2}$ inch (12.7 mm) in thickness, the fasteners shall extend through the sheathing. Each shingle shall be attached with a minimum of two fasteners.

1507.8.7 Application. Wood shingles shall be laid with a side lap not less than $1\frac{1}{2}$ inches (38 mm) between joints in adjacent courses, and not be in direct alignment in alternate courses. Spacing between shingles shall be $\frac{1}{4}$ to $\frac{3}{8}$ inch (6.4 to 9.5 mm). Weather exposure for wood shingles shall not exceed that set in Table 1507.8.7.

TABLE 1507.8.7
WOOD SHINGLE WEATHER EXPOSURE AND ROOF SLOPE

| ROOFING MATERIAL | LENGTH (inches) | GRADE | EXPOSURE (inches) | |
|------------------------------------|-----------------|-------|----------------------|-----------------------|
| | | | 3:12 pitch to < 4:12 | 4:12 pitch or steeper |
| Shingles of naturally durable wood | 16 | No. 1 | 3.75 | 5 |
| | | No. 2 | 3.5 | 4 |
| | | No. 3 | 3 | 3.5 |
| | 18 | No. 1 | 4.25 | 5.5 |
| | | No. 2 | 4 | 4.5 |
| | | No. 3 | 3.5 | 4 |
| | 24 | No. 1 | 5.75 | 7.5 |
| | | No. 2 | 5.5 | 6.5 |
| | | No. 3 | 5 | 5.5 |

For SI: 1 inch = 25.4 mm.

1507.8.8 Flashing. At the juncture of the roof and vertical surfaces, flashing and counterflashing shall be provided in accordance with the manufacturer's installation instructions, and where of metal, shall be not less than 0.019-inch (0.48 mm) (No. 26 galvanized sheet gage) corrosion-resistant metal. The valley flashing shall extend at least 11 inches (279 mm) from the centerline each way and have a splash diverter rib not less than 1 inch (25 mm) high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 4 inches (102 mm). For roof slopes of three units vertical in 12 units horizontal (25-percent slope) and over, the valley flashing shall have a 36-inch-wide (914 mm) underlayment of either one layer of Type I underlayment running the full length of the valley or a self-adhering polymer-modified bitumen sheet complying with ASTM D1970, in addition to other required underlayment. In areas where the average daily temperature in January is 25°F (-4°C) or less or where there is a possibility of ice forming along the eaves causing a backup of water, the metal valley flashing underlayment shall be solidly cemented to the roofing underlayment for slopes under seven units vertical in 12 units horizontal (58-percent slope) or self-adhering polymer-modified bitumen sheet shall be installed.

1507.9 Wood shakes. The installation of wood shakes shall comply with the provisions of this section and Table 1507.8.

1507.9.1 Deck requirements. Wood shakes shall only be used on solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall be not less than 1-inch by 4-inch (25 mm by 102 mm) nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners. Where 1-inch by 4-inch (25 mm by 102 mm) spaced sheathing is installed at 10 inches (254 mm) on center, additional 1-inch by 4-inch (25 mm by 102 mm) boards shall be installed between the sheathing boards.

1507.9.1.1 Solid sheathing required. Solid sheathing is required in areas where the average daily temperature in January is 25°F (-4°C) or less or where there is a possibility of ice forming along the eaves causing a backup of water.

1507.9.2 Deck slope. Wood shakes shall only be used on slopes of not less than four units vertical in 12 units horizontal (33-percent slope).

1507.9.3 Underlayment. Underlayment shall comply with ASTM D226, Type I or ASTM D4869.

1507.9.3.1 Underlayment and high wind. Underlayment applied in areas subject to high winds [V_{asd} greater than 110 mph (49 m/s) as determined in accordance with Section 1609.3.1] shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's installation instructions. Fasteners are to be applied along the overlap not more than 36 inches (914 mm) on center.

Underlayment installed where V_{asdb} in accordance with Section 1609.3.1, equals or exceeds 120 mph (54 m/s) shall comply with ASTM D226, Type II or ASTM D4869 Type IV. The underlayment shall be attached in

a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at the side laps. Underlayment shall be applied in accordance with the manufacturer's installation instructions except all laps shall be a minimum of 4 inches (102 mm). Underlayment shall be attached using metal or plastic cap nails with a head diameter of not less than 1 inch (25 mm) with a thickness of at least 32-gage [0.0134 inch (0.34 mm)] sheet metal. The cap nail shank shall be a minimum of 12 gage [0.105 inch (2.67 mm)] with a length to penetrate through the roof sheathing or a minimum of $\frac{3}{4}$ inch (19.1 mm) into the roof sheathing.

Exception: As an alternative, adhered underlayment complying with ASTM D1970 shall be permitted.

1507.9.4 Ice barrier. In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet shall be used in lieu of normal underlayment and extend from the lowest edges of all roof surfaces to a point at least 24 inches (610 mm) inside the exterior wall line of the building.

Exception: Detached accessory structures that contain no conditioned floor area.

1507.9.5 Interlayerment. Interlayerment shall comply with ASTM D226, Type I.

1507.9.6 Material standards. Wood shakes shall comply with the requirements of Table 1507.9.6.

**TABLE 1507.9.6
WOOD SHAKE MATERIAL REQUIREMENTS**

| MATERIAL | MINIMUM GRADES | APPLICABLE GRADING RULES |
|--|----------------|--------------------------|
| Wood shakes of naturally durable wood | 1 | CSSB |
| Taper sawn shakes of naturally durable wood | 1 or 2 | CSSB |
| Preservative-treated shakes and shingles of naturally durable wood | 1 | CSSB |
| Fire-retardant-treated shakes and shingles of naturally durable wood | 1 | CSSB |
| Preservative-treated taper sawn shakes of Southern pine treated in accordance with AWP A U1 (Commodity Specification A, Use Category 3B and Section 5.6) | 1 or 2 | TFS |

CSSB = Cedar Shake and Shingle Bureau.

TFS = Forest Products Laboratory of the Texas Forest Services.

1507.9.7 Attachment. Fasteners for wood shakes shall be corrosion resistant with a minimum penetration of $\frac{3}{4}$ inch (19.1 mm) into the sheathing. For sheathing less than $\frac{1}{2}$ inch (12.7 mm) in thickness, the fasteners shall extend through the sheathing. Each shake shall be attached with a minimum of two fasteners.

1507.9.8 Application. Wood shakes shall be laid with a side lap not less than $1\frac{1}{2}$ inches (38 mm) between joints in adjacent courses. Spacing between shakes in the same course shall be $\frac{3}{8}$ to $\frac{5}{8}$ inch (9.5 to 15.9 mm) for shakes

and taper sawn shakes of naturally durable wood and shall be $\frac{1}{4}$ to $\frac{3}{8}$ inch (6.4 to 9.5 mm) for preservative taper sawn shakes. Weather exposure for wood shakes shall not exceed those set in Table 1507.9.8.

1507.9.9 Flashing. At the juncture of the roof and vertical surfaces, flashing and counterflashing shall be provided in accordance with the manufacturer's installation instructions, and where of metal, shall be not less than 0.019-inch (0.48 mm) (No. 26 galvanized sheet gage) corrosion-resistant metal. The valley flashing shall extend at least 11 inches (279 mm) from the centerline each way and have a splash diverter rib not less than 1 inch (25 mm) high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 4 inches (102 mm). For roof slopes of three units vertical in 12 units horizontal (25-percent slope) and over, the valley flashing shall have a 36-inch-wide (914 mm) underlayment of either one layer of Type I underlayment running the full length of the valley or a self-adhering polymer-modified bitumen sheet complying with ASTM D1970, in addition to other required underlayment. In areas where the average daily temperature in January is 25°F (-4°C) or less or where there is a possibility of ice forming along the eaves causing a backup of water, the metal valley flashing underlayment shall be solidly cemented to the roofing underlayment for slopes under seven units vertical in 12 units horizontal (58-percent slope) or self-adhering polymer-modified bitumen sheet shall be installed.

1507.10 Built-up roofs. The installation of built-up roofs shall comply with the provisions of this section.

1507.10.1 Slope. Built-up roofs shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope) for drainage, except for coal-tar built-up roofs that shall have a design slope of not less than one-eighth unit vertical in 12 units horizontal (1-percent slope).

1507.10.2 Material standards. Built-up roof covering materials shall comply with the standards in Table 1507.10.2 or UL 55A.

1507.11 Modified bitumen roofing. The installation of modified bitumen roofing shall comply with the provisions of this section.

1507.11.1 Slope. Modified bitumen membrane roofs shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope) for drainage.

1507.11.2 Material standards. Modified bitumen roof coverings shall comply with CGSB 37-GP-56M, ASTM D6162, ASTM D6163, ASTM D6164, ASTM D6222, ASTM D6223, ASTM D6298 or ASTM D6509.

1507.12 Thermoset single-ply roofing. The installation of thermoset single-ply roofing shall comply with the provisions of this section.

1507.12.1 Slope. Thermoset single-ply membrane roofs shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope) for drainage.

TABLE 1507.9.8
WOOD SHAKE WEATHER EXPOSURE AND ROOF SLOPE

| ROOFING MATERIAL | LENGTH (inches) | GRADE | EXPOSURE (inches) 4:12 PITCH OR STEEPER |
|--|-----------------|-------|---|
| Shakes of naturally durable wood | 18 | No. 1 | 7.5 |
| | 24 | No. 1 | 10 ^a |
| Preservative-treated taper sawn shakes of Southern yellow pine | 18 | No. 1 | 7.5 |
| | 24 | No. 1 | 10 |
| | 18 | No. 2 | 5.5 |
| | 24 | No. 2 | 7.5 |
| Taper sawn shakes of naturally durable wood | 18 | No. 1 | 7.5 |
| | 24 | No. 1 | 10 |
| | 18 | No. 2 | 5.5 |
| | 24 | No. 2 | 7.5 |

For SI: 1 inch = 25.4 mm.

a. For 24-inch by 0.375-inch handsplit shakes, the maximum exposure is 7.5 inches.

TABLE 1507.10.2
BUILT-UP ROOFING MATERIAL STANDARDS

| MATERIAL STANDARD | STANDARD |
|---|---------------------------------|
| Acrylic coatings used in roofing | ASTM D6083 |
| Aggregate surfacing | ASTM D1863 |
| Asphalt adhesive used in roofing | ASTM D3747 |
| Asphalt cements used in roofing | ASTM D3019; D2822; D4586 |
| Asphalt-coated glass fiber base sheet | ASTM D4601 |
| Asphalt coatings used in roofing | ASTM D1227; D2823; D2824; D4479 |
| Asphalt glass felt | ASTM D2178 |
| Asphalt primer used in roofing | ASTM D41 |
| Asphalt-saturated and asphalt-coated organic felt base sheet | ASTM D2626 |
| Asphalt-saturated organic felt (perforated) | ASTM D226 |
| Asphalt used in roofing | ASTM D312 |
| Coal-tar cements used in roofing | ASTM D4022; D5643 |
| Coal-tar saturated organic felt | ASTM D227 |
| Coal-tar pitch used in roofing | ASTM D450; Type I or II |
| Coal-tar primer used in roofing, dampproofing and waterproofing | ASTM D43 |
| Glass mat, coal tar | ASTM D4990 |
| Glass mat, venting type | ASTM D4897 |
| Mineral-surfaced inorganic cap sheet | ASTM D3909 |
| Thermoplastic fabrics used in roofing | ASTM D5665, D5726 |

1507.12.2 Material standards. Thermoset single-ply roof coverings shall comply with ASTM D4637, ASTM D5019 or CGSB 37-GP-52M.

1507.12.3 Ballasted thermoset low-slope roofs. Ballasted thermoset low-slope roofs (roof slope < 2:12) shall be installed in accordance with this section and Section 1504.4. Stone used as ballast shall comply with ASTM D448 or ASTM D7655.

1507.13 Thermoplastic single-ply roofing. The installation of thermoplastic single-ply roofing shall comply with the provisions of this section.

1507.13.1 Slope. Thermoplastic single-ply membrane roofs shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope).

1507.13.2 Material standards. Thermoplastic single-ply roof coverings shall comply with ASTM D4434, ASTM D6754, ASTM D6878 or CGSB CAN/CGSB 37-54.

1507.13.3 Ballasted thermoplastic low-slope roofs. Ballasted thermoplastic low-slope roofs (roof slope < 2:12) shall be installed in accordance with this section and Section 1504.4. Stone used as ballast shall comply with ASTM D448 or ASTM D7655.

1507.14 Sprayed polyurethane foam roofing. The installation of sprayed polyurethane foam roofing shall comply with the provisions of this section.

1507.14.1 Slope. Sprayed polyurethane foam roofs shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope) for drainage.

1507.14.2 Material standards. Spray-applied polyurethane foam insulation shall comply with Type III or IV as defined in ASTM C1029.

1507.14.3 Application. Foamed-in-place roof insulation shall be installed in accordance with the manufacturer's instructions. A liquid-applied protective coating that complies with Table 1507.14.3 shall be applied no less than 2 hours nor more than 72 hours following the application of the foam.

TABLE 1507.14.3
PROTECTIVE COATING MATERIAL STANDARDS

| MATERIAL | STANDARD |
|-------------------------------------|------------|
| Acrylic coating | ASTM D6083 |
| Silicone coating | ASTM D6694 |
| Moisture-cured polyurethane coating | ASTM D6947 |

1507.14.4 Foam plastics. Foam plastic materials and installation shall comply with Chapter 26.

1507.15 Liquid-applied roofing. The installation of liquid-applied roofing shall comply with the provisions of this section.

1507.15.1 Slope. Liquid-applied roofing shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope).

1507.15.2 Material standards. Liquid-applied roofing shall comply with ASTM C836, ASTM C957, ASTM D1227 or ASTM D3468, ASTM D6083, ASTM D6694 or ASTM D6947.

1507.16 Vegetative roofs, roof gardens and landscaped roofs. *Vegetative roofs*, roof gardens and landscaped roofs shall comply with the requirements of this chapter, Sections 1607.12.3 and 1607.12.3.1 and the *Fire Code*.

1507.16.1 Structural fire resistance. The structural frame and roof construction supporting the load imposed upon the roof by the *vegetative roof*, roof gardens or landscaped roofs shall comply with the requirements of Table 601.

1507.17 Photovoltaic shingles. The installation of *photovoltaic shingles* shall comply with the provisions of this section.

1507.17.1 Deck requirements. *Photovoltaic shingles* shall be applied to a solid or closely fitted deck, except where the shingles are specifically designed to be applied over spaced sheathing.

1507.17.2 Deck slope. *Photovoltaic shingles* shall not be installed on roof slopes less than three units vertical in 12 units horizontal (25-percent slope).

1507.17.3 Underlayment. Unless otherwise noted, required underlayment shall conform to ASTM D226, ASTM D4869 or ASTM D6757.

1507.17.4 Underlayment application. Underlayment shall be applied shingle fashion, parallel to and starting from the eave, lapped 2 inches (51 mm) and fastened sufficiently to hold in place.

1507.17.4.1 High wind attachment. Underlayment applied in areas subject to high winds [V_{asd} greater than 110 mph (49 m/s) as determined in accordance with Section 1609.3.1] shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's instructions. Fasteners shall be applied along the overlap at not more than 36 inches (914 mm) on center. Underlayment installed where V_{asd} is not less than 120 mph (54 m/s) shall comply with

ASTM D226, Type II, ASTM D4869, Type IV or ASTM D6757. The underlayment shall be attached in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at the side laps. Underlayment shall be applied in accordance with Section 1507.2.8 except all laps shall be a minimum of 4 inches (102 mm). Underlayment shall be attached using metal or plastic cap nails with a head diameter of not less than 1 inch (25 mm) with a thickness of not less than 32-gage [0.0134 inch (0.34 mm)] sheet metal. The cap nail shank shall be a minimum of 12 gage [0.105 inch (2.67 mm)] with a length to penetrate through the roof sheathing or a minimum of $\frac{3}{4}$ inch (19.1 mm) into the roof sheathing.

Exception: As an alternative, adhered underlayment complying with ASTM D1970 shall be permitted.

1507.17.4.2 Ice barrier. In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer modified bitumen sheet shall be used instead of normal underlayment and extend from the lowest edges of all roof surfaces to a point not less than 24 inches (610 mm) inside the *exterior wall* line of the building.

Exception: Detached accessory structures that contain no conditioned floor area.

1507.17.5 Fasteners. Fasteners for *photovoltaic shingles* shall be galvanized, stainless steel, aluminum or copper roofing nails, minimum 12-gage [0.105 inch (2.67 mm)] shank with a minimum $\frac{3}{8}$ -inch-diameter (9.5 mm) head, of a length to penetrate through the roofing materials and a minimum of $\frac{3}{4}$ inch (19.1 mm) into the roof sheathing. Where the roof sheathing is less than $\frac{3}{4}$ inch (19.1 mm) thick, the nails shall penetrate through the sheathing. Fasteners shall comply with ASTM F1667.

1507.17.6 Material standards. *Photovoltaic shingles* shall be *listed* and labeled in accordance with UL 1703.

1507.17.7 Attachment. *Photovoltaic shingles* shall be attached in accordance with the manufacturer's installation instructions.

1507.17.8 Wind resistance. *Photovoltaic shingles* shall be tested in accordance with procedures and acceptance criteria in ASTM D3161. *Photovoltaic shingles* shall comply with the classification requirements of Table 1504.1.1 for the appropriate maximum nominal design wind speed. *Photovoltaic shingle* packaging shall bear a *label* to indicate compliance with the procedures in ASTM D3161 and the required classification from Table 1504.1.1.

1507.18 Hot-applied rubberized-asphalt roofing. The installation of hot-applied rubberized-asphalt roofing shall comply with the provisions of this section.

1507.18.1 Slope. Hot-applied rubberized-asphalt roof membranes shall not be required to have a minimum design slope (0-percent slope).

1507.18.2 Material standards. Hot-applied rubberized-asphalt roofing shall be one-part hot-applied rubberized asphalt and comply with CAN/CGSB-37.50-M89.

1507.18.3 Protected membrane ballasted low-slope roofs. Protected membrane ballasted roof assemblies with a low-slope (roof slope < 2:12) shall be installed in accordance with this section and Section 1504.4. Stone used as ballast shall comply with ASTM D448.

SECTION 1508 ROOF INSULATION

1508.1 General. The use of above-deck thermal insulation shall be permitted provided such insulation is covered with an approved roof covering and passes the tests of NFPA 276 or UL 1256 when tested as an assembly.

Exceptions:

1. Foam plastic roof insulation shall conform to the material and installation requirements of Chapter 26.
2. Where a concrete roof deck is used and the above-deck thermal insulation is covered with an approved roof covering.

1508.1.1 Cellulosic fiberboard. Cellulosic fiberboard roof insulation shall conform to the material and installation requirements of Chapter 23.

1508.2 Material standards. Above-deck thermal insulation board shall comply with the standards in Table 1508.2.

**TABLE 1508.2
MATERIAL STANDARDS FOR ROOF INSULATION**

| | |
|--------------------------------|-----------------------------------|
| Cellular glass board | ASTM C552 |
| Composite boards | ASTM C1289, Type III, IV, V or VI |
| Expanded polystyrene | ASTM C578 |
| Extruded polystyrene | ASTM C578 |
| Fiber-reinforced gypsum board | ASTM C1278 |
| Glass-faced gypsum board | ASTM C1177 |
| Mineral fiber insulation board | ASTM C726 |
| Perlite board | ASTM C728 |
| Polyisocyanurate board | ASTM C1289, Type I or II |
| Wood fiberboard | ASTM C208 |

SECTION 1509 RADIANT BARRIERS INSTALLED ABOVE DECK

1509.1 General. A *radiant barrier* installed above a deck shall comply with Sections 1509.2 through 1509.4.

1509.2 Fire testing. *Radiant barriers* shall be permitted for use above decks where the *radiant barrier* is covered with an approved roof covering and the system consisting of the *radiant barrier* and the roof covering complies with the requirements of either FM 4550 or UL 1256.

1509.3 Installation. The low emittance surface of the *radiant barrier* shall face the continuous airspace between the *radiant barrier* and the roof covering.

1509.4 Material standards. A *radiant barrier* installed above a deck shall comply with ASTM C1313/1313M.

SECTION 1510 ROOFTOP STRUCTURES

1510.1 General. The provisions of this section shall govern the construction of rooftop structures.

1510.2 Penthouses. Penthouses in compliance with Sections 1510.2.1 through 1510.2.5 shall be considered as a portion of the story directly below the roof deck on which such penthouses are located. All other penthouses shall be considered as an additional story of the building.

1510.2.1 Height above roof deck. Penthouses constructed on buildings of other than Type I construction shall not exceed 20 feet (6096 mm) in height above the roof deck as measured to the highest point of the roof of the penthouse.

Exceptions:

1. Where used to enclose tanks or elevators that travel to the roof level, penthouses shall be permitted to have a maximum height of 28 feet (8534 mm) above the roof deck.
2. Penthouses located on the roof of buildings of Type I construction shall not be limited in height.

1510.2.2 Area limitation. The aggregate area of penthouses and other enclosed rooftop structures shall not exceed one-third the area of the supporting roof deck. Such penthouses and other enclosed rooftop structures shall not be required to be included in determining the building area or number of stories as regulated by Section 503.1. The area of such penthouses shall not be included in determining the fire area specified in Section 901.7.

1510.2.3 Use limitations. Penthouses shall not be used for purposes other than the shelter of mechanical or electrical equipment, tanks, or vertical shaft openings in the roof assembly.

1510.2.4 Weather protection. Provisions such as louvers, louver blades or flashing shall be made to protect the mechanical and electrical equipment and the building interior from the elements.

1510.2.5 Type of construction. Penthouses shall be constructed with walls, floors and roofs as required for the type of construction of the building on which such penthouses are built.

Exceptions:

1. On buildings of Type I construction, the exterior walls and roofs of penthouses with a *fire separation distance* greater than 5 feet (1524 mm) and less than 20 feet (6096 mm) shall be permitted to have not less than a 1-hour fire-resistance rating. The exterior walls and roofs of penthouses with a fire separation distance of 20 feet (6096 mm) or greater shall not be required to have a fire-resistance rating.
2. On buildings of Type I construction two stories or less in height above grade plane or of Type II

construction, the exterior walls and roofs of penthouses with a *fire separation distance* greater than 5 feet (1524 mm) and less than 20 feet (6096 mm) shall be permitted to have not less than a 1-hour fire-resistance rating or a lesser fire-resistance rating as required by Table 602 and be constructed of fire-retardant-treated wood. The exterior walls and roofs of penthouses with a *fire separation distance* of 20 feet (6096 mm) or greater shall be permitted to be constructed of fire-retardant-treated wood and shall not be required to have a fire-resistance rating. Interior framing and walls shall be permitted to be constructed of fire-retardant-treated wood.

3. On buildings of Type III, IV or V construction, the exterior walls of penthouses with a fire separation distance greater than 5 feet (1524 mm) and less than 20 feet (6096 mm) shall be permitted to have not less than a 1-hour fire-resistance rating or a lesser fire-resistance rating as required by Table 602. On buildings of Type III, IV or VA construction, the exterior walls of penthouses with a fire separation distance of 20 feet (6096 mm) or greater shall be permitted to be of Type IV or noncombustible construction or fire-retardant-treated wood and shall not be required to have a fire-resistance rating.

1510.3 Tanks. Tanks having a capacity of more than 500 gallons (1893 L) located on the roof deck of a building shall be supported on masonry, reinforced concrete, steel or Type IV construction provided that, where such supports are located in the building above the lowest *story*, the support shall be fire-resistance rated as required for Type IA construction.

1510.3.1 Valve and drain. In the bottom or on the side near the bottom of the tank, a pipe or outlet, fitted with a suitable quick-opening valve for discharging the contents into a drain in an emergency shall be provided.

1510.3.2 Location. Tanks shall not be placed over or near a stairway or an elevator shaft, unless there is a solid roof or floor underneath the tank.

1510.3.3 Tank cover. Unenclosed roof tanks shall have covers sloping toward the perimeter of the tanks.

1510.4 Cooling towers. Cooling towers located on the roof deck of a building and greater than 250 square feet (23.2 m²) in base area or greater than 15 feet (4572 mm) in height above the roof deck, as measured to the highest point on the cooling tower, where the roof is greater than 50 feet (15 240 mm) in height above grade plane shall be constructed of noncombustible materials. The base area of cooling towers shall not exceed one-third the area of the supporting roof deck.

Exception: Drip boards and the enclosing construction shall be permitted to be of wood not less than 1 inch (25 mm) nominal thickness, provided the wood is covered on the exterior of the tower with noncombustible material.

1510.5 Towers, spires, domes and cupolas. Towers, spires, domes and cupolas shall be of a type of construction having

fire-resistance ratings not less than required for the building on top of which such tower, spire, dome or cupola is built. Towers, spires, domes and cupolas greater than 85 feet (25 908 mm) in height above grade plane as measured to the highest point on such structures, and either greater than 200 square feet (18.6 m²) in horizontal area or used for any purpose other than a belfry or an architectural embellishment, shall be constructed of and supported on Type I or II construction.

1510.5.1 Noncombustible construction required. Towers, spires, domes and cupolas greater than 60 feet (18 288 mm) in height above the highest point at which such structure contacts the roof as measured to the highest point on such structure, or that exceeds 200 square feet (18.6 m²) in area at any horizontal section, or which is intended to be used for any purpose other than a belfry or architectural embellishment, or is located on the top of a building greater than 50 feet (1524 mm) in building height shall be constructed of and supported by noncombustible materials and shall be separated from the building below by construction having a fire-resistance rating of not less than 1.5 hours with openings protected in accordance with Section 711. Such structures located on the top of a building greater than 50 feet (15 240 mm) in building height shall be supported by noncombustible construction.

1510.5.2 Towers and spires. Enclosed towers and spires shall have exterior walls constructed as required for the building on top of which such towers and spires are built. The roof covering of spires shall be not less than the same class of roof covering required for the building on top of which the spire is located.

1510.6 Mechanical equipment screens. *Mechanical equipment screens* shall be constructed of the materials specified for the exterior walls in accordance with the type of construction of the building. Where the fire separation distance is greater than 5 feet (1524 mm), *mechanical equipment screens* shall not be required to comply with the fire-resistance rating requirements.

1510.6.1 Height limitations. *Mechanical equipment screens* shall not exceed 18 feet (5486 mm) in height above the roof deck, as measured to the highest point on the mechanical equipment screen.

Exceptions:

1. Where located on buildings of Type IA construction, the height of mechanical equipment screens shall not be limited.
2. Where used to screen elevators that travel to the roof level, mechanical equipment screens shall not exceed 20 feet (6096 mm) in height above the roof deck as measured to the highest point on the mechanical equipment screen.

1510.6.2 Type I, II, III and IV construction. Regardless of the requirements in Section 1510.6, *mechanical equipment screens* that are located on the roof decks of buildings of Type I, II, III or IV construction shall be permitted

to be constructed of combustible materials in accordance with any one of the following limitations:

1. The fire separation distance shall be not less than 20 feet (6096 mm) and the height of the *mechanical equipment screen* above the roof deck shall not exceed 4 feet (1219 mm) as measured to the highest point on the *mechanical equipment screen*.
2. The fire separation distance shall be not less than 20 feet (6096 mm) and the *mechanical equipment screen* shall be constructed of fire-retardant-treated wood complying with Section 2303.2 for exterior installation.
3. Where exterior wall covering panels are used, the panels shall have a flame spread index of 25 or less when tested in the minimum and maximum thicknesses intended for use, with each face tested independently in accordance with ASTM E84 or UL 723. The panels shall be tested in the minimum and maximum thicknesses intended for use in accordance with, and shall comply with the acceptance criteria of, NFPA 285 and shall be installed as tested. Where the panels are tested as part of an exterior wall assembly in accordance with NFPA 285, the panels shall be installed on the face of the *mechanical equipment screen* supporting structure in the same manner as they were installed on the tested exterior wall assembly.

1510.6.3 Type V construction. The height of mechanical equipment screens located on the roof decks of buildings of Type V construction, as measured from grade plane to the highest point on the mechanical equipment screen, shall be permitted to exceed the maximum building height allowed for the building by other provisions of this code where complying with any one of the following limitations, provided the fire separation distance is greater than 5 feet (1524 mm):

1. Where the fire separation distance is not less than 20 feet (6096 mm), the height above grade plane of the mechanical equipment screen shall not exceed 4 feet (1219 mm) more than the maximum building height allowed;
2. The *mechanical equipment screen* shall be constructed of noncombustible materials;
3. The *mechanical equipment screen* shall be constructed of fire-retardant-treated wood complying with Section 2303.2 for exterior installation; or
4. Where the fire separation distance is not less than 20 feet (6096 mm), the *mechanical equipment screen* shall be constructed of materials having a flame spread index of 25 or less when tested in the minimum and maximum thicknesses intended for use with each face tested independently in accordance with ASTM E84 or UL 723.

1510.7 Photovoltaic panels and modules. Rooftop-mounted *photovoltaic panels* and *modules* shall be designed in accordance with this section.

1510.7.1 Wind resistance. Rooftop-mounted *photovoltaic panels* and *modules* shall be designed for component and cladding wind loads in accordance with Chapter 16 using an effective wind area based on the dimensions of a single unit frame.

1510.7.2 Fire classification. Rooftop-mounted *photovoltaic panels* and *modules* shall have the fire classification in accordance with Section 1505.9.

1510.7.3 Installation. Rooftop-mounted *photovoltaic panels* and *modules* shall be installed in accordance with the manufacturer's instructions.

1510.7.4 Photovoltaic panels and modules. Rooftop-mounted *photovoltaic panels* and *modules* shall be listed and labeled in accordance with UL 1703 and shall be installed in accordance with the manufacturer's instructions.

1510.8 Other rooftop structures. Rooftop structures not regulated by Sections 1510.2 through 1510.7 shall comply with Sections 1510.8.1 through 1510.8.5, as applicable.

1510.8.1 Aerial supports. Aerial supports shall be constructed of noncombustible materials.

Exception: Aerial supports not greater than 12 feet (3658 mm) in height as measured from the roof deck to the highest point on the aerial supports shall be permitted to be constructed of combustible materials.

1510.8.2 Bulkheads. Bulkheads used for the shelter of mechanical or electrical equipment or vertical shaft openings in the roof assembly shall comply with Section 1510.2 as penthouses. Bulkheads used for any other purpose shall be considered as an additional story of the building.

1510.8.3 Dormers. Dormers shall be of the same type of construction as required for the roof in which such dormers are located or the exterior walls of the building.

1510.8.4 Fences. Fences and similar structures shall comply with Section 1510.6 as *mechanical equipment screens*.

1510.8.5 Flagpoles. Flagpoles and similar structures shall not be required to be constructed of noncombustible materials and shall not be limited in height or number.

1510.9 Structural fire resistance. The structural frame and roof construction supporting imposed loads upon the roof by any rooftop structure shall comply with the requirements of Table 601. The fire-resistance reduction permitted by Table 601, Note a, shall not apply to roofs containing rooftop structures.

SECTION 1511 REROOFING

1511.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15.

Exceptions:

1. *Roof replacement* or *roof recover* of existing low-slope roof coverings shall not be required to meet

the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide positive roof drainage.

2. Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1503.4 for roofs that provide for positive roof drainage. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1503.4.

1511.2 Structural and construction loads. Structural roof components shall be capable of supporting the roof-covering system and the material and equipment loads that will be encountered during installation of the system.

1511.3 Roof replacement. *Roof replacement* shall include the removal of all existing layers of roof coverings down to the roof deck.

Exception: Where the existing roof assembly includes an ice barrier membrane that is adhered to the roof deck, the existing ice barrier membrane shall be permitted to remain in place and covered with an additional layer of ice barrier membrane in accordance with Section 1507.

1511.3.1 Roof recover. The installation of a new roof covering over an existing roof covering shall be permitted where any of the following conditions occur:

1. Where the new roof covering is installed in accordance with the roof covering manufacturer's approved instructions.
2. Complete and separate roofing systems, such as standing-seam metal roof panel systems, that are designed to transmit the roof loads directly to the building's structural system and that do not rely on existing roofs and roof coverings for support, shall not require the removal of existing roof coverings.
3. Metal panel, metal shingle and concrete and clay tile roof coverings shall be permitted to be installed over existing wood shake roofs when applied in accordance with Section 1511.4.
4. The application of a new protective coating over an existing spray polyurethane foam roofing system shall be permitted without tear off of existing roof coverings.

1511.3.1.1 Exceptions. A *roof recover* shall not be permitted where any of the following conditions occur:

1. Where the existing roof or roof covering is water soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.
2. Where the existing roof covering is slate, clay, cement or asbestos-cement tile.
3. Where the existing roof has two or more applications of any type of roof covering.

1511.4 Roof recovering. Where the application of a new roof covering over wood shingle or shake roofs creates a combustible concealed space, the entire existing surface shall be covered with gypsum board, mineral fiber, glass fiber or other *approved* materials securely fastened in place.

1511.5 Reinstallation of materials. Existing slate, clay or cement tile shall be permitted for reinstallation, except that damaged, cracked or broken slate or tile shall not be reinstalled. Existing vent flashing, metal edgings, drain outlets, collars and metal counterflashings shall not be reinstalled where rusted, damaged or deteriorated. Aggregate surfacing materials shall not be reinstalled.

1511.6 Flashings. Flashings shall be reconstructed in accordance with *approved* manufacturer's installation instructions. Metal flashing to which bituminous materials are to be adhered shall be primed prior to installation.

SECTION 1512 ROOF SOLAR REFLECTANCE AND THERMAL EMITTANCE

1512.1 Roof solar reflectance and thermal emittance. Low-sloped roofs shall comply with the roof solar reflectance and thermal emittance requirements set forth in Section 5.5.3.1.1 of the *Energy Conservation Code—Commercial* and Section R402.6 of the *Energy Conservation Code—Residential*, as applicable.

CHAPTER 16

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.

SECTION 1602 DEFINITIONS AND NOTATIONS

1602.1 Definitions. The following terms are defined in Chapter 2:

ALLOWABLE STRESS DESIGN.

DEAD LOADS.

DESIGN STRENGTH.

DIAPHRAGM.

Diaphragm, blocked.

Diaphragm boundary.

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.

A_f = wind area in accordance with Chapters 26 through 30 of ASCE 7.

D = Dead load.

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

E = Combined effect of horizontal and vertical earthquake induced forces as defined in Section 12.4.2 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 = Roof live load greater than 20 psf (0.96 kN/m²) and floor live load.

L_r = Roof live load of 20 psf (0.96 kN/m²) or less.

R = Rain load.

S = Snow load.

T = Self-straining load.

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

V_{ult} = Ultimate design wind speeds (3-second gust), miles per hour (mph) (km/hr) determined from Figure 1609.3(1), 1609.3(2), 1609.3(3) 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 1603.1.8 shall be indicated on the *construction documents*.

Exception: *Construction documents* for buildings constructed in accordance with the *conventional light-frame construction* provisions of Section 2308 shall indicate the following structural design information:

1. Floor and roof live loads.
2. Ground snow load, P_g .
3. Ultimate design wind speed, V_{ult} , (3-second gust), miles per hour (mph) (km/hr) and nominal design wind speed, V_{asd} , as determined in accordance with Section 1609.3.1 and wind exposure.

4. *Seismic design category and site class.*
5. Flood design data, if located in *flood hazard areas* established in Section 1612.3.
6. Design load-bearing values of soils.

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 1607.10 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 1607.12).

1603.1.3 Roof snow load data. The ground snow load, P_g , shall be indicated. In areas where the ground snow load, P_g , exceeds 10 pounds per square foot (psf) (0.479 kN/m²), the following additional information shall also be provided, regardless of whether snow loads govern the design of the roof:

1. Flat-roof snow load, P_f .
2. Snow exposure factor, C_e .
3. Snow load importance factor, I_s .
4. Thermal factor, C_t .
5. Drift surcharge load(s), P_d , where the sum of P_d and P_f exceeds 20 psf (0.96 kN/m²).
6. Width of snow drift(s), w .

1603.1.3.1 Roof drift on existing structures. It shall be the responsibility of the owner undertaking work on its *premises* to determine the impact of that work on the roof snow load of any adjacent existing *structure(s)*. The following information shall be provided in any permit application for a new or altered building:

1. The increased snow load on the roof of adjacent existing structure(s), if any, due to the proposed work.
2. Information sufficient to show whether the roof of any adjacent structure can safely support any additional drift load caused by the work.
3. A plan to strengthen the roof of any adjacent structure so that it is able to support the new snow loads caused by the work.

Exception: Items 2 and 3 are not required where:

1. The proposed work will not increase the snow load on the roof of the adjacent structure above 30 psf; and
2. The *owner* of the existing adjacent structure denies access to the *owner* undertaking the proposed work to inspect and measure the roof joists with ceiling access to determine whether the roof of the existing adjacent structure can support any additional snow drift loads caused by the work, and the *owner* undertaking the proposed work provides evidence of such denial in accordance with Section 3307.5.2.

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) and nominal design wind speed, V_{asdb} , as determined in accordance with Section 1609.3.1.
2. *Risk category.*
3. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.
4. Applicable internal pressure coefficient.
5. Design wind pressures 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/m²).

1603.1.5 Earthquake design data. The following information related to seismic loads shall be shown, regardless of whether seismic loads govern the design of the lateral force-resisting system of the structure:

1. *Risk category.*
2. Seismic importance factor, I_e .
3. Mapped spectral response acceleration parameters, S_s and S_1 .
4. *Site class.*
5. Design spectral response acceleration parameters, S_{DS} and S_{DI} .
6. *Seismic design category.*
7. Basic seismic force-resisting system(s).
8. Design base shear(s).
9. Seismic response coefficient(s), CS .
10. Response modification coefficient(s), R .
11. Analysis procedure used.

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 floodproofed.

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 shall be indicated along with the specified section of this code that addresses the special loading condition.

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.

1603.1.8.2 Superimposed dead loads. The assumed superimposed dead loads including, but not limited to, hung ceilings, mechanical, electrical, and plumbing equipment shall be indicated on the *construction documents*.

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*.

TABLE 1604.3
DEFLECTION LIMITS^{a, b, c, h, i}

| CONSTRUCTION | <i>L</i> | <i>S</i> or <i>W</i> ^f | <i>D</i> + <i>L</i> ^{d, g} |
|--------------------------------------|---------------|-----------------------------------|-------------------------------------|
| Roof members: ^e | | | |
| Supporting plaster or stucco ceiling | <i>l</i> /360 | <i>l</i> /360 | <i>l</i> /240 |
| Supporting nonplaster ceiling | <i>l</i> /240 | <i>l</i> /240 | <i>l</i> /180 |
| Not supporting ceiling | <i>l</i> /180 | <i>l</i> /180 | <i>l</i> /120 |
| Floor members | <i>l</i> /360 | — | <i>l</i> /240 |
| Exterior walls: | | | |
| With plaster or stucco finishes | — | <i>l</i> /360 | — |
| With other brittle finishes | — | <i>l</i> /240 | — |
| With flexible finishes | — | <i>l</i> /120 | — |
| Interior partitions: ^b | | | |
| With plaster or stucco finishes | <i>l</i> /360 | — | — |
| With other brittle finishes | <i>l</i> /240 | — | — |
| With flexible finishes | <i>l</i> /120 | — | — |
| Farm buildings | — | — | <i>l</i> /180 |
| Greenhouses | — | — | <i>l</i> /120 |

For SI: 1 foot = 304.8 mm.

- 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.
- 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 1607.14.
- See Section 2403 for glass supports.
- 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 wood structural 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 wood structural members at all other moisture conditions, 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.
- 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.
- 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.
- For steel structural members, the dead load shall be taken as zero.
- 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.
- For cantilever members, *l* shall be taken as twice the length of the cantilever.

1604.3 Serviceability. Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections and lateral drift. See Section 12.12.1 of ASCE 7 for drift limits applicable to earthquake loading.

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 CJ, SJI JG, SJI K or SJI LH/DLH, as applicable.

1604.3.4 Masonry. The deflection of masonry structural members shall not exceed that permitted by TMS 402/ACI 530/ASCE 5.

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, Section 1610 for lateral soil loads and Section 1613 for earthquake 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.

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*.

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 1719.

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 for walls of structures assigned to *Seismic Design Category A* and to Section 12.11 of ASCE 7 for walls of structures assigned to all other *seismic design categories*. 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 and 1613 for earthquake 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 Table 1607.1, or the snow load specified in Section 1608, 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 Table 1607.1, or the snow load

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: <ul style="list-style-type: none"> • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities. |
| 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: <ul style="list-style-type: none"> • Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. • Buildings and other structures containing Group E occupancies with an occupant load greater than 250. • Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. • Group I-2 occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities. • Group I-3 occupancies. • Any other occupancy with an occupant load greater than 5,000.^a • Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. • Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: <ul style="list-style-type: none"> 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 <i>Fire Code</i>; and 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: <ul style="list-style-type: none"> • Group I-2 occupancies having surgery or emergency treatment facilities. • Fire, rescue, ambulance and police stations and emergency vehicle garages. • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. • Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures. • Buildings and other structures containing quantities of highly toxic materials that: <ul style="list-style-type: none"> Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the <i>Fire Code</i>; and Are sufficient to pose a threat to the public if released.^b • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression. |

a. For purposes of occupant load calculation, occupancies required by Table 1004.1.2 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

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.

specified in Section 1608, in accordance with Section 1605, acting on the cantilevered portion of the deck, and no live load or snow 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 earthquakes and 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.

1604.10 Wind and seismic detailing. Lateral force-resisting systems shall meet seismic detailing requirements and limitations prescribed in this code and ASCE 7, excluding Chapter 14 and Appendix 11A, even when wind *load effects* are greater than seismic *load effects*.

SECTION 1605 LOAD COMBINATIONS

1605.1 General. Buildings and other structures and portions thereof shall be designed to resist:

1. The load combinations specified in Section 1605.2, 1605.3.1 or 1605.3.2;
2. The load combinations specified in Chapters 18 through 23; and
3. The seismic load effects including overstrength factor in accordance with Section 12.4.3 of ASCE 7 where required by Section 12.2.5.2, 12.3.3.3 or 12.10.2.1 of ASCE 7. With the simplified procedure of ASCE 7 Section 12.14, the seismic load effects including overstrength factor in accordance with Section 12.14.3.2 of ASCE 7 shall be used.

Applicable loads shall be considered, including both earthquake and wind, in accordance with the specified load combinations. Each load combination shall also be investigated with one or more of the variable loads set to zero.

Where the load combinations with overstrength factor in Section 12.4.3.2 of ASCE 7 apply, they shall be used as follows:

1. The basic combinations for strength design with overstrength factor in lieu of Equations 16-5 and 16-7 in Section 1605.2.
2. The basic combinations for *allowable stress design* with overstrength factor in lieu of Equations 16-12, 16-14 and 16-16 in Section 1605.3.1.
3. The basic combinations for *allowable stress design* with overstrength factor in lieu of Equations 16-21 and 16-22 in Section 1605.3.2.

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 combina-

tions specified in Section 1605.2 or 1605.3 shall be permitted. Where the load combinations specified in Section 1605.2 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 Load combinations using strength design or load and resistance factor design. Where strength design or load and resistance factor design is used, buildings and other structures, and portions thereof, shall be designed to resist the most critical effects resulting from the following combinations of factored loads:

$$1.4(D + F) \quad (\text{Equation 16-1})$$

$$1.2(D + F) + 1.6(L + H) + 0.5(L_r \text{ or } S \text{ or } R) \quad (\text{Equation 16-2})$$

$$1.2(D + F) + 1.6(L_r \text{ or } S \text{ or } R) + 1.6H + (f_1 L \text{ or } 0.5W) \quad (\text{Equation 16-3})$$

$$1.2(D + F) + 1.0W + f_1 L + 1.6H + 0.5(L_r \text{ or } S \text{ or } R) \quad (\text{Equation 16-4})$$

$$1.2(D + F) + 1.0E + f_1 L + 1.6H + f_2 S \quad (\text{Equation 16-5})$$

$$0.9D + 1.0W + 1.6H \quad (\text{Equation 16-6})$$

$$0.9(D + F) + 1.0E + 1.6H \quad (\text{Equation 16-7})$$

where:

$f_1 = 1$ for places of public assembly live loads in excess of 100 pounds per square foot (4.79 kN/m²), and parking garages; and 0.5 for other live loads.

$f_2 = 0.7$ for roof configurations (such as saw tooth) that do not shed snow off the structure, and 0.2 for other roof configurations.

Exceptions:

1. Where other factored load combinations are specifically required by other provisions of this code, such combinations shall take precedence.
2. Where the effect of H resists the primary variable load effect, a load factor of 0.9 shall be included with H where H is permanent and H shall be set to zero for all other conditions.

1605.2.1 Other loads. Where flood loads, F_a , are to be considered in the design, the load combinations of Section 2.3.3 of ASCE 7 shall be used. Where self-straining loads, T , are considered in design, their structural effects in combination with other loads shall be determined in accordance with Section 2.3.5 of ASCE 7. Where an ice-sensitive structure is subjected to loads due to atmospheric icing, the load combinations of Section 2.3.4 of ASCE 7 shall be considered.

1605.3 Load combinations using allowable stress design.

1605.3.1 Basic load combinations. Where *allowable stress design* (working stress design), as permitted by this code, is used, structures and portions thereof shall resist

the most critical effects resulting from the following combinations of loads:

$$D + F \quad (\text{Equation 16-8})$$

$$D + H + F + L \quad (\text{Equation 16-9})$$

$$D + H + F + (L_r \text{ or } S \text{ or } R) \quad (\text{Equation 16-10})$$

$$D + H + F + 0.75(L) + 0.75(L_r \text{ or } S \text{ or } R) \quad (\text{Equation 16-11})$$

$$D + H + F + (0.6W \text{ or } 0.7E) \quad (\text{Equation 16-12})$$

$$D + H + F + 0.75(0.6W) + 0.75L + 0.75(L_r \text{ or } S \text{ or } R) \quad (\text{Equation 16-13})$$

$$D + H + F + 0.75(0.7E) + 0.75L + 0.75S \quad (\text{Equation 16-14})$$

$$0.6D + 0.6W + H \quad (\text{Equation 16-15})$$

$$0.6(D + F) + 0.7E + H \quad (\text{Equation 16-16})$$

Exceptions:

1. Crane hook loads need not be combined with roof live load or with more than three-fourths of the snow load or one-half of the wind load.
2. Flat roof snow loads of 30 psf (1.44 kN/m²) or less and roof live loads of 30 psf (1.44 kN/m²) or less need not be combined with seismic loads. Where flat roof snow loads exceed 30 psf (1.44 kN/m²), 20 percent shall be combined with seismic loads.
3. Where the effect of H resists the primary variable load effect, a load factor of 0.6 shall be included with H where H is permanent and H shall be set to zero for all other conditions.
4. In Equation 16-15, the wind load, W , is permitted to be reduced in accordance with Exception 2 of Section 2.4.1 of ASCE 7.
5. In Equation 16-16, $0.6D$ is permitted to be increased to $0.9D$ for the design of special reinforced masonry shear walls complying with Chapter 21.

1605.3.1.1 Stress increases. Increases in allowable stresses specified in the appropriate material chapter or the referenced standards shall not be used with the load combinations of Section 1605.3.1, except that increases shall be permitted in accordance with Chapter 23.

1605.3.1.2 Other loads. Where flood loads, F_w , are to be considered in design, the load combinations of Section 2.4.2 of ASCE 7 shall be used. Where self-straining loads, T , are considered in design, their structural effects in combination with other loads shall be determined in accordance with Section 2.4.4 of ASCE 7. Where an ice-sensitive structure is subjected to loads due to atmospheric icing, the load combinations of Section 2.4.3 of ASCE 7 shall be considered.

1605.3.2 Alternative basic load combinations. In lieu of the basic load combinations specified in Section 1605.3.1, structures and portions thereof shall be permitted to be designed for the most critical effects resulting from the following combinations. When using these alternative

basic load combinations that include wind or seismic loads, 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. When using allowable stresses that have been increased or load combinations that have been reduced as permitted by the material chapter of this code or the referenced standards, where wind loads are calculated in accordance with Chapters 26 through 31 of ASCE 7, the coefficient (ω) in the following equations shall be taken as 1.3. For other wind loads, (ω) shall be taken as 1. When allowable stresses have not been increased or load combinations have not been reduced as permitted by the material chapter of this code or the referenced standards, (ω) shall be taken as 1. When 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. When using these alternative basic load combinations for proportioning foundations for loadings, which include seismic loads, the vertical seismic load effect, E_v , in Equation 12.4-4 of ASCE 7 is permitted to be taken equal to zero.

$$D + L + (L_r \text{ or } S \text{ or } R) \quad (\text{Equation 16-17})$$

$$D + L + 0.6 \omega W \quad (\text{Equation 16-18})$$

$$D + L + 0.6 \omega W + S/2 \quad (\text{Equation 16-19})$$

$$D + L + S + 0.6 \omega W/2 \quad (\text{Equation 16-20})$$

$$D + L + S + E/1.4 \quad (\text{Equation 16-21})$$

$$0.9D + E/1.4 \quad (\text{Equation 16-22})$$

Exceptions:

1. Crane hook loads need not be combined with roof live loads or with more than three-fourths of the snow load or one-half of the wind load.
2. Flat roof snow loads of 30 psf (1.44 kN/m²) or less and roof live loads of 30 psf (1.44 kN/m²) or less need not be combined with seismic loads. Where flat roof snow loads exceed 30 psf (1.44 kN/m²), 20 percent shall be combined with seismic loads.

1605.3.2.1 Other loads. Where F , H or T are to be considered in the design, each applicable load shall be added to the combinations specified in Section 1605.3.2. Where self-straining loads, T , are considered in design, their structural effects in combination with other loads shall be determined in accordance with Section 2.4.4 of ASCE 7.

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 Design dead load. 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*.

SECTION 1607 LIVE LOADS

1607.1 General. Live loads are those loads defined in Chapter 2 of this code.

1607.2 Loads not specified. For occupancies or uses not designated in Table 1607.1, 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.

Exception: In the alteration of buildings erected before July 1, 1925, the engineer of record is authorized to apply a maximum reduction of 30 percent of the specified minimum live loads in Table 1607.1 for live loads above 40 psf (1.92 kN/m²), provided that official live load placards are posted on the public areas of the affected floors showing this reduced live load. Live loads shall not be reduced to less than 40 psf.

1607.4 Concentrated live loads. Floors 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 2½ feet by 2½ 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/m²) or greater. The partition load shall be not less than a uniformly distributed live load of 15 psf (0.72 kN/m²).

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/m²) 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/m²) where the design basis helicopter has a maximum take-off weight greater than 3,000 pounds (13.35 kN).

TABLE 1607.1
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, *L_o*, AND
MINIMUM CONCENTRATED LIVE LOADS^a

| OCCUPANCY OR USE | UNIFORM (psf) | CONCENTRATED (pounds) |
|---|---|-----------------------|
| 1. Apartments (see residential) | — | — |
| 2. Access floor systems | | |
| Office use | 50 | 2,000 |
| Computer use | 100 | 2,000 |
| 3. Armories and drill rooms | 150 ^m | — |
| 4. Assembly areas | | |
| Fixed seats (fastened to floor) | 60 ^m | |
| Follow spot, projections and control rooms | 50 | — |
| Lobbies | 100 ^m | |
| Movable seats | 100 ^m | |
| Stage floors | 150 ^m | |
| Platforms (assembly) | 100 ^m | |
| Other assembly areas | 100 ^m | |
| 5. Balconies and decks ^b | Same as occupancy served | — |
| 6. Catwalks | 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 controlroom 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. Garages (passenger vehicles only) | 50 ^m | Note a |
| Top deck of exposed garage | 50, plus snow loading in accordance with Section 1608 | |
| Trucks and buses | See Section 1607.7 | See Section 1607.7 |
| 15. Handrails, guards and grab bars | See Section 1607.8 | |
| 16. Helipads | See Section 1607.6 | |
| 17. Hospitals | | |
| Corridors above first floor | 80 | 1,000 |
| Operating rooms, laboratories | 60 | 1,000 |
| Patient rooms | 40 | 1,000 |
| 18. Hotels (see residential) | — | — |
| 19. Libraries | | |
| Corridors above first floor | 80 | 1,000 |
| Reading rooms | 60 | 1,000 |
| Stack rooms | 150 ^{b, m} | 1,000 |
| 20. Manufacturing | | |
| Heavy | 250 ^m | 3,000 |
| Light | 125 ^m | 2,000 |

(continued)

TABLE 1607.1—continued
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o , AND
MINIMUM CONCENTRATED LIVE LOADS^a

| OCCUPANCY OR USE | UNIFORM (psf) | CONCENTRATED (pounds) |
|--|---------------------|-----------------------|
| 21. Marquees, except one- and two-family dwellings | 75 | — |
| 22. 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 |
| 23. Penal institutions | | |
| Cell blocks | 40 | — |
| Corridors | 100 | — |
| 24. Recreational uses: | | |
| Bowling alleys, poolrooms and similar uses | 75 ^m | — |
| Dance halls and ballrooms | 100 ^m | — |
| Gymnasiums | 100 ^m | — |
| Ice skating rink | 250 ^m | — |
| 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} | — |
| 25. Residential | | |
| 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 | — |
| 26. Roofs | | |
| All other construction, except one- and two-family dwellings | 30 | — |
| Ordinary flat, pitched, and curved roofs (that are not occupiable) | 30 | — |
| 27. Schools | | |
| Classrooms | 40 | 1,000 |
| Corridors above first floor | 80 | 1,000 |
| First-floor corridors | 100 | 1,000 |
| 28. Scuttles, skylight ribs and accessible ceilings | — | 200 |
| 29. Sidewalks, vehicular driveways and yards, subject to trucking | 250 ^{d, m} | 8,000 ^e |
| 30. Stairs and exits | | |
| One- and two-family dwellings | 40 | 300 ^f |
| All other | 100 | 300 ^f |
| 31. Storage warehouses (shall be designed for heavier loads if required for anticipated storage) | | |
| Heavy | 250 ^m | — |
| Light | 125 ^m | — |
| 32. Stores | | |
| Retail | | |
| First floor | 100 | 1,000 |
| Upper floors | 75 | 1,000 |
| Wholesale, all floors | 125 ^m | 1,000 |

(continued)

TABLE 1607.1—continued
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o , AND
MINIMUM CONCENTRATED LIVE LOADS^a

| OCCUPANCY OR USE | UNIFORM (psf) | CONCENTRATED (pounds) |
|---|----------------------|-----------------------|
| 33. Vehicle barriers | See Section 1607.8.3 | |
| 34. Walkways and elevated platforms (other than exitways) | 60 | — |
| 35. Yards and terraces, pedestrians | 100 ^m | — |

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm²,1 square foot = 0.0929 m²,1 pound per square foot = 0.0479 kN/m², 1 pound = 0.004448 kN,1 pound per cubic foot = 16 kg/m³.

- a. Floors in garages or portions of buildings used for the storage of motor vehicles shall be designed for the uniformly distributed live loads of Table 1607.1 or the following concentrated loads: (1) for garages restricted to passenger vehicles accommodating not more than nine passengers, 3,000 pounds acting on an area of 4.5 inches by 4.5 inches; (2) for mechanical parking structures without slab or deck that are used for storing passenger vehicles only, 2,250 pounds per wheel.
- b. The loading 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. The nominal shelf depth shall not exceed 12 inches for each face; and
 3. Parallel rows of double-faced book stacks shall be separated by aisles not less than 36 inches wide.
- c. Design in accordance with ICC 300.
- d. Other uniform loads in accordance with an approved method containing provisions for truck loadings shall be considered where appropriate.
- e. The concentrated wheel load shall be applied on an area of 4.5 inches by 4.5 inches.
- f. The minimum concentrated load on stair treads shall be applied on an area of 2 inches by 2 inches. This load need not be assumed to act concurrently with the uniform load.
- g. Where snow loads occur that are in excess of the design conditions, the structure shall be designed to support the loads due to the increased loads caused by drift buildup or a greater snow design determined by the building official (see Section 1608).
- h. See Section 1604.8.3 for decks attached to exterior walls.
- i. Uninhabitable attics without storage are those where the maximum clear height between the joists and rafters is less than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- j. Uninhabitable attics with storage are those where the maximum clear height between the joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses.

The live load need only be applied to those portions of the joists or truss bottom chords where both of the following conditions are met:

 - i. The attic area is accessible from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is a minimum of 30 inches; and
 - ii. The slopes of the joists or truss bottom chords are no greater than two 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.
- k. 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.
- l. Areas of occupiable roofs, other than roof gardens and assembly areas, shall be designed for appropriate loads as approved by the building official. Unoccupied landscaped areas of roofs shall be designed in accordance with Section 1607.12.3.
- m. Live load reduction is not permitted unless specific exceptions of Section 1607.10 apply.

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 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 1607.7.1 through 1607.7.5.

1607.7.1 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.

1607.7.2 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 1607.7.1.

1607.7.3 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 1607.7.1. 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/m²). This live load shall not be reduced.

1607.7.4 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 1607.7.5.

1607.7.4.1 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.

1607.7.5 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.

1607.8 Loads on handrails, guards, grab bars, seats and vehicle barriers. Handrails, *guards*, grab bars, accessible seats, accessible benches and vehicle barriers shall be designed and constructed for the structural loading conditions set forth in this section.

1607.8.1 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 1607.8.1.1 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).

1607.8.1.1 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.

1607.8.1.2 Intermediate rails. Intermediate rails (all those except the handrail), balusters and panel fillers shall be designed to resist a concentrated load of 50 pounds (0.22 kN) in accordance with Section 4.5.1 of ASCE 7.

1607.8.2 Grab bars, shower seats and dressing room bench seats. Grab bars, shower seats and dressing room bench seats 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 or seat so as to produce the maximum load effects.

1607.8.3 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.

1607.9 Impact loads. The live loads specified in Sections 1607.3 through 1607.8 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.

1607.9.1 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.

1607.9.2 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, shaft- or motor-driven, 20 percent; and (2) reciprocating machinery or power-driven units, 50 percent. Percentages shall be increased where specified by the manufacturer.

1607.9.3 Elements supporting hoists for façade access equipment. In combination with any other applicable live loads, structural elements that support hoists for façade access equipment shall be designed for an ultimate load consisting of the larger of the rated load of the hoist times 4.0, but not less than 5000 pounds (22.2 kN).

1607.9.4 Lifeline anchorages for façade access equipment. In combination with any other applicable live loads, lifeline anchorages and structural elements that support lifeline anchorages shall be designed for an ultimate load of at least 5000 pounds (22.2 kN) for each attached lifeline, in every direction that a fall arrest load may be applied.

1607.10 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 1607.10.1 or 1607.10.2. Uniform live loads at roofs are permitted to be reduced in accordance with Section 1607.12.2.

1607.10.1 Basic uniform live load reduction. Subject to the limitations of Sections 1607.10.1.1 through 1607.10.1.3 and Table 1607.1, members for which a value of $K_{LL}A_T$ is 400 square feet (37.16 m²) or more are permitted to be designed for a reduced uniformly distributed live load, L , in accordance with the following equation:

$$L = L_o \left(0.25 + \frac{15}{\sqrt{K_{LL}A_T}} \right) \quad (\text{Equation 16-23})$$

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

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 1607.10.1).

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

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

**TABLE 1607.10.1
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: Edge beams with cantilever slabs Cantilever beams One-way slabs Two-way slabs Members without provisions for continuous shear transfer normal to their span | 1 |

1607.10.1.1 One-way slabs. The tributary area, A_T , for use in Equation 16-23 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.

1607.10.1.2 Heavy live loads. Live loads that exceed 100 psf (4.79 kN/m²) shall not be reduced.

Exceptions:

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 1607.10.1.
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.

1607.10.1.3 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 1607.10.1.

1607.10.2 Alternative uniform live load reduction. As an alternative to Section 1607.10.1 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/m²) 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/m²), the design live load for any structural member supporting 150 square feet (13.94 m²) or more is permitted to be reduced in accordance with Equation 16-24.
4. For one-way slabs, the area, A , for use in Equation 16-24 shall not exceed the product of the slab span and a width normal to the span of 0.5 times the slab span.

$$R = 0.08(A - 150) \quad (\text{Equation 16-24})$$

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:

$$R = 23.1(1 + D/L_o) \quad (\text{Equation 16-25})$$

where:

A = Area of floor supported by the member, square feet (m²).

D = Dead load per square foot (m²) of area supported.

L_o = Unreduced live load per square foot (m²) of area supported.

R = Reduction in percent.

1607.11 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 1607.10.

1607.12 Roof loads. The structural supports of roofs and marquees shall be designed to resist wind and, where applicable, snow and earthquake 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.

1607.12.1 Distribution of roof loads. Where uniform roof live loads are reduced to less than 20 psf (0.96 kN/m²) in accordance with Section 1607.12.2.1 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 1607.12.2 for reductions in minimum roof live loads and Section 7.5 of ASCE 7 for partial snow loading.

1607.12.2 General. 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 1607.12.2.1.

1607.12.2.1 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).

$$L_r = L_o R_1 R_2 \quad (\text{Equation 16-26})$$

where: $12 \leq L_r \leq 20$

For SI: $L_r = L_o R_1 R_2$

where: $0.58 \leq L_r \leq 0.96$

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:

$$R_1 = 1 \text{ for } A_i \leq 200 \text{ square feet (18.58 m}^2\text{)} \quad (\text{Equation 16-27})$$

$$R_1 = 1.2 - 0.001A_i \text{ for } 200 \text{ square feet} < A_i < 600 \text{ square feet} \quad (\text{Equation 16-28})$$

For SI: $1.2 - 0.011A_i$ for $18.58 \text{ square meters} < A_i < 55.74 \text{ square meters}$

$$R_1 = 0.6 \text{ for } A_i \geq 600 \text{ square feet (55.74 m}^2\text{)} \quad (\text{Equation 16-29})$$

where:

A_i = Tributary area (span length multiplied by effective width) in square feet (m²) supported by the member, and

$$R_2 = 1 \text{ for } F \leq 4 \quad (\text{Equation 16-30})$$

$$R_2 = 1.2 - 0.05 F \text{ for } 4 < F < 12 \quad (\text{Equation 16-31})$$

$$R_2 = 0.6 \text{ for } F \geq 12 \quad (\text{Equation 16-32})$$

where:

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

1607.12.3 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 1607.10.

1607.12.3.1 Vegetative and landscaped roofs. The weight of all landscaping materials shall be considered as dead load and shall be computed on the basis of saturation of the soil as determined in accordance with ASTM E2397. The uniform design live load in unoccupied landscaped areas on roofs shall be 30 psf (1.44 kN/m²). The uniform design live load for occupied landscaped areas on roofs shall be determined in accordance with Table 1607.1.

1607.12.4 Awnings and canopies. Awnings and canopies shall be designed for uniform live loads as required in Table 1607.1 as well as for snow loads and wind loads as specified in Sections 1608 and 1609.

1607.12.5 Photovoltaic panel systems. Roof structures that provide support for *photovoltaic panel systems* shall be designed in accordance with Sections 1607.12.5.1 through 1607.12.5.4, as applicable.

1607.12.5.1 Roof live load. Roof surfaces to be covered by solar photovoltaic panels or modules shall be designed for the roof live load, L_r , assuming that the photovoltaic panels or modules are not present. The roof photovoltaic live load in areas covered by solar photovoltaic panels or modules shall be in addition to the panel loading unless the area covered by each solar photovoltaic panel or module is inaccessible. Areas where the clear space between the panels and the rooftop is not more than 24 inches (610 mm) shall be considered inaccessible. Roof surfaces not covered by photovoltaic panels shall be designed for the roof live load.

1607.12.5.2 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 1607.12.5.1 and other applicable loads. Where applicable, snow drift loads created by the photovoltaic panels or modules shall be included.

1607.12.5.3 Photovoltaic panels or modules installed as an independent structure. Solar photovoltaic panels or modules 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. All other loads and combinations in accordance with Section 1605 shall be accommodated.

Solar photovoltaic panels or modules that are designed to be the roof, span to structural supports and have accessible/occupied space underneath shall have the panels or modules and all supporting structures designed to support a roof photovoltaic live load, as defined in Section 1607.12.5.1 in combination with other applicable loads. Solar photovoltaic panels or modules in this application are not permitted to be classified as “not accessible” in accordance with Section 1607.12.5.1.

1607.12.5.4 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.

1607.13 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.

1607.13.1 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.

1607.13.2 Vertical impact force. The maximum wheel loads of the crane shall be increased by the percentages shown below to determine the induced vertical impact or vibration force:

| | |
|---|------------|
| 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-gear bridge, trolley and hoist | 0 percent |

1607.13.3 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.

1607.13.4 Longitudinal force. The longitudinal force on crane runway beams, except for bridge cranes with hand-gear 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.

1607.14 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/m²).

1607.14.1 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 mm²)] of the fabric face at a height of 54 inches (1372 mm) above the floor.

1607.15 Powered maintenance platforms. The structural supports for powered maintenance platforms shall be designed in accordance with the requirements in 29 CFR 1910 Subpart F Standard 1910.66 ("Powered Platforms for Building Maintenance") of Occupational Safety and Health Administration Standards.

SECTION 1608 SNOW LOADS

1608.1 General. Design snow loads shall be determined in accordance with Chapter 7 of ASCE 7, but the design roof load shall not be less than that determined by Section 1607.

1608.1.1 Snow load for the District of Columbia. The ground snow load for the District of Columbia as shown in Figure 1608.2 shall be a minimum of 25 psf (1.20 kN/m²) plus drifting, or 30 psf (1.44 kN/m²) equivalent uniform load, whichever is greater.

1608.2 Ground snow loads. The ground snow loads to be used in determining the design snow loads for roofs shall be determined in accordance with ASCE 7 or Figure 1608.2 for the contiguous United States and Table 1608.2 for Alaska. Site-specific case studies shall be made in areas designated "CS" in Figure 1608.2. Ground snow loads for sites at elevations above the limits indicated in Figure 1608.2 and for all sites within the CS areas shall be *approved*. Ground snow load determination for such sites shall be based on an extreme value statistical analysis of data available in the vicinity of the site using a value with a 2-percent annual probability of being exceeded (50-year mean recurrence interval). Snow loads are zero for Hawaii, except in mountainous regions as *approved* by the *building official*.

1608.3 Ponding instability. Susceptible bays of roofs shall be evaluated for ponding instability in accordance with Section 7.11 of ASCE 7.

TABLE 1608.2
GROUND SNOW LOADS, p_g , FOR ALASKAN LOCATIONS

| LOCATION | POUNDS PER SQUARE FOOT | LOCATION | POUNDS PER SQUARE FOOT | LOCATION | POUNDS PER SQUARE FOOT |
|---------------|------------------------|----------|------------------------|------------------|------------------------|
| Adak | 30 | Galena | 60 | Petersburg | 150 |
| Anchorage | 50 | Gulkana | 70 | St. Paul Islands | 40 |
| Angoon | 70 | Homer | 40 | Seward | 50 |
| Barrow | 25 | Juneau | 60 | Shemya | 25 |
| Barter Island | 35 | Kenai | 70 | Sitka | 50 |
| Bethel | 40 | Kodiak | 30 | Talkeetna | 120 |
| Big Delta | 50 | Kotzebue | 60 | Unalakleet | 50 |
| Cold Bay | 25 | McGrath | 70 | Valdez | 160 |
| Cordova | 100 | Nenana | 80 | Whittier | 300 |
| Fairbanks | 60 | Nome | 70 | Wrangell | 60 |
| Fort Yukon | 60 | Palmer | 50 | Yakutat | 150 |

For SI: 1 pound per square foot = 0.0479 kN/m².

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.

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. The type of opening protection required, the ultimate design wind speed, V_{ult} , and the exposure category for a site is permitted to be determined in accordance with Section 1609 or ASCE 7. 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 600 shall 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.
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.
6. Wind tunnel tests in accordance with ASCE 49 and Sections 31.4 and 31.5 of ASCE 7.

The wind speeds in Figures 1609.3(1), 1609.3(2) and 1609.3(3) 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.

1609.1.1.2 Minimum wind loads. The wind loads used in the design of the main windforce-resisting system ultimate load shall not be less than 30 psf (1.44 kN/m²) multiplied by the area of the building or structure projected on a vertical plane normal to the wind direction. In the calculation of design ultimate wind loads for components and cladding for buildings, the algebraic sum of the pressures acting on opposite faces shall be taken into account. The design ultimate wind pressure of components and cladding of buildings shall not be less than 30 psf (1.44 kN/m²) acting in either direction normal to the surface. The design ultimate wind pressure for open buildings and other structures shall not be less than 30 psf (1.44 kN/m²) multiplied by the area A_p .

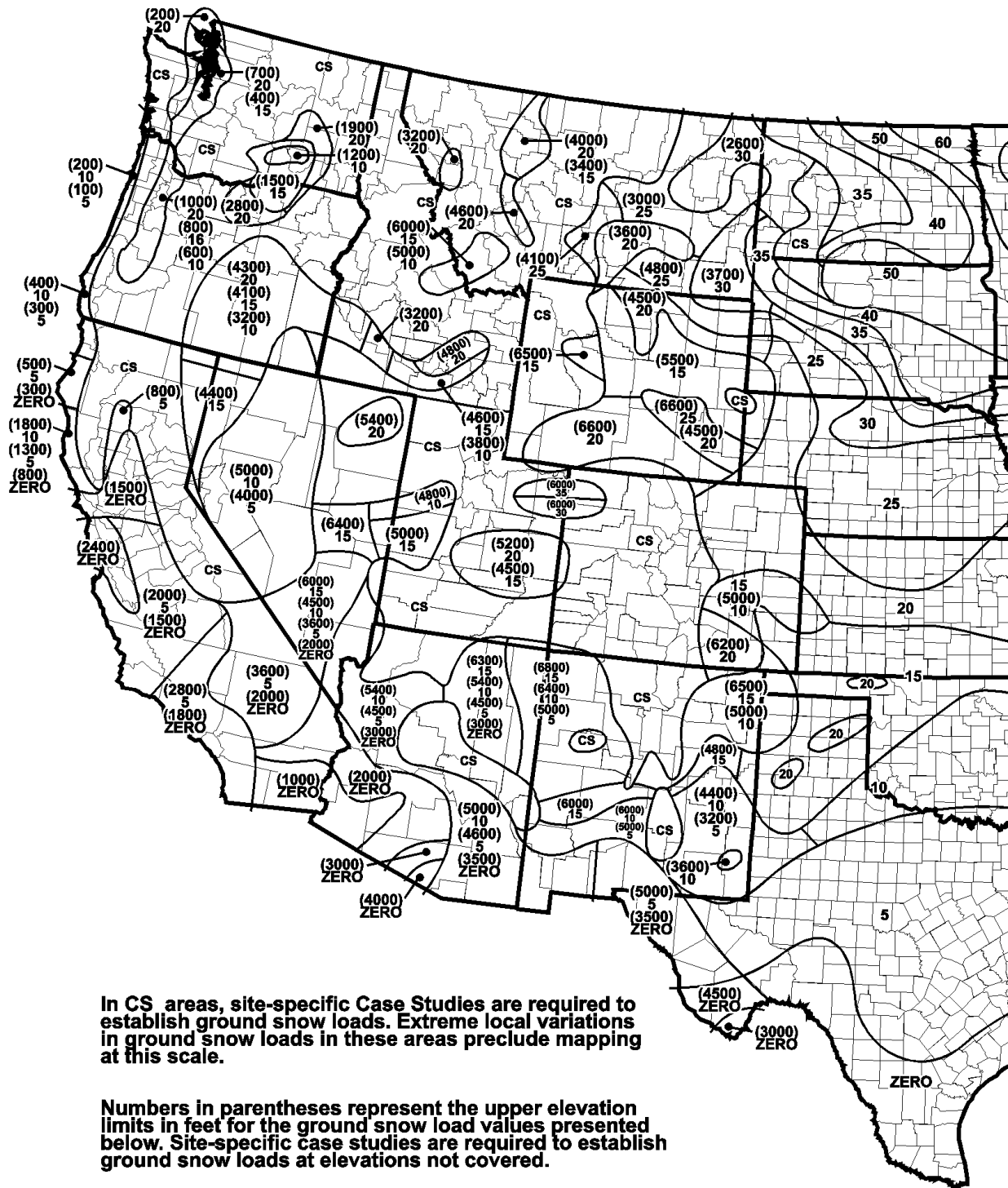
Exception: The ultimate wind pressures on tanks, signs, chimneys, stacks, cooling towers, dish antennas, and similar exposed surfaces and their supporting frames shall not be less than 50 psf (2.39 kN/m²) of projected area.

1609.1.2 Protection of openings. In *wind-borne debris regions*, glazing in buildings shall be impact resistant or protected with an impact-resistant covering meeting the requirements of an *approved* impact-resistant standard or ASTM E1996 and ASTM E1886 referenced herein 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.

Exceptions:

1. Wood structural panels with a minimum thickness of $\frac{7}{16}$ inch (11.1 mm) and maximum panel span of 8 feet (2438 mm) shall be permitted for opening protection in buildings with a mean roof height of 33 feet (10 058 mm) or less that are classified as a Group R-3 or R-4 occupancy. Panels shall be precut so that they shall be 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 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. Attachment in accordance with Table 1609.1.2 with corrosion-resistant attachment hardware provided and anchors permanently installed on the building is permitted for buildings with a mean roof height of 45 feet (13 716 mm) or less where V_{asd} determined in accordance with Section 1609.3.1 does not exceed 140 mph (63 m/s).



To convert lb/sq ft to kNm², multiply by 0.0479.

To convert feet to meters, multiply by 0.3048.

FIGURE 1608.2
GROUND SNOW LOADS, p_g , FOR THE UNITED STATES (psf)



FIGURE 1608.2—continued
GROUND SNOW LOADS, p_g , FOR THE UNITED STATES (psf)

TABLE 1609.1.2
WIND-BORNE DEBRIS PROTECTION FASTENING
SCHEDULE FOR WOOD STRUCTURAL PANELS^{a, b, c, d}

| FASTENER TYPE | FASTENER SPACING (inches) | | |
|---|---------------------------|---------------------------------|---------------------------------|
| | Panel Span ≤ 4 feet | 4 feet < Panel Span ≤ 6 feet | 6 feet < Panel Span ≤ 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 |
| 1/4-inch diameter 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.

- This table is based on 140 mph wind speeds and a 45-foot mean roof height.
- Fasteners shall be installed at opposing ends of the wood structural panel. Fasteners shall be located a minimum of 1 inch from the edge of the panel.
- Anchors shall penetrate through the exterior wall covering with an embedment length of 2 inches minimum into the building frame. Fasteners shall be located a minimum of 2 1/2 inches from the edge of concrete block or concrete.
- Where panels are attached to masonry or masonry/stucco, they shall be attached using vibration-resistant anchors having a minimum ultimate withdrawal capacity of 1,500 pounds.

- 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.
- 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.

1609.1.2.1 Louvers. Louvers protecting intake and exhaust ventilation ducts not assumed to be open that are located within 30 feet (9144 mm) of grade 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:

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

6.2.2.1 *Wind Zone 1*—130 mph ≤ ultimate design wind speed, V_{ult} < 140 mph.

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.

6.2.2.3 *Wind Zone 3*—150 mph (58 m/s) ≤ ultimate design wind speed, V_{ult} ≤ 160 mph (63 m/s), or 140 mph (54 m/s) ≤ ultimate design wind speed, V_{ult} ≤ 160 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.

6.2.2.4 *Wind Zone 4*—ultimate design wind speed, V_{ult} > 160 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.

1609.2 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). 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 I buildings and structures shall be obtained from Figure 1609.3(3). 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 Section 26.5.1 of ASCE 7.

In nonhurricane-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.

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) shall be converted to nominal design wind speeds, V_{asd} , using Table 1609.3.1 or Equation 16-33.

$$V_{asd} = V_{ult} \sqrt{0.6} \quad \text{(Equation 16-33)}$$

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).

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.

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.

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.

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:

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.

Exposure C. Exposure C shall apply for all cases where Exposure B or D does not apply.

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 Roof systems. Roof systems shall be designed and constructed in accordance with Sections 1609.5.1 through 1609.5.3, as applicable.

1609.5.1 Roof deck. The roof deck shall be designed to withstand the wind pressures determined in accordance with ASCE 7.

1609.5.2 Roof coverings. Roof coverings shall comply with Section 1609.5.1.

Exception: Rigid tile roof coverings that are air permeable and installed over a roof deck complying with Section 1609.5.1 are permitted to be designed in accordance with Section 1609.5.3.

Asphalt shingles installed over a roof deck complying with Section 1609.5.1 shall comply with the wind-resistance requirements of Section 1504.1.1.

1609.5.3 Rigid tile. Wind loads on rigid tile roof coverings shall be determined in accordance with the following equation:

$$M_a = q_h C_L b L L_a [1.0 - G C_p] \quad \text{(Equation 16-34)}$$

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.

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

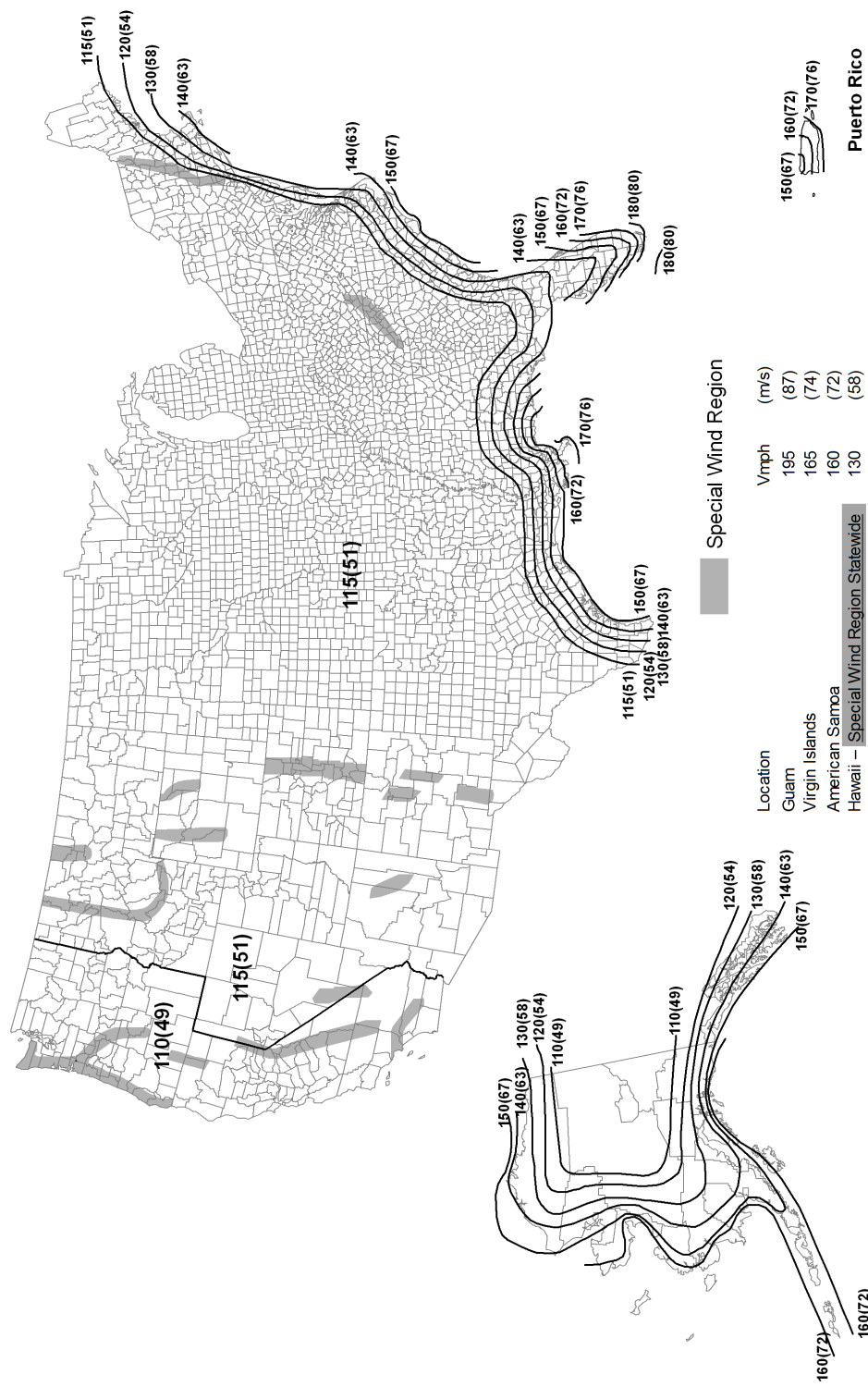
L = Length, feet (mm) of the roof tile.

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 0.76L 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/m²) determined from Section 27.3.2 of ASCE 7.

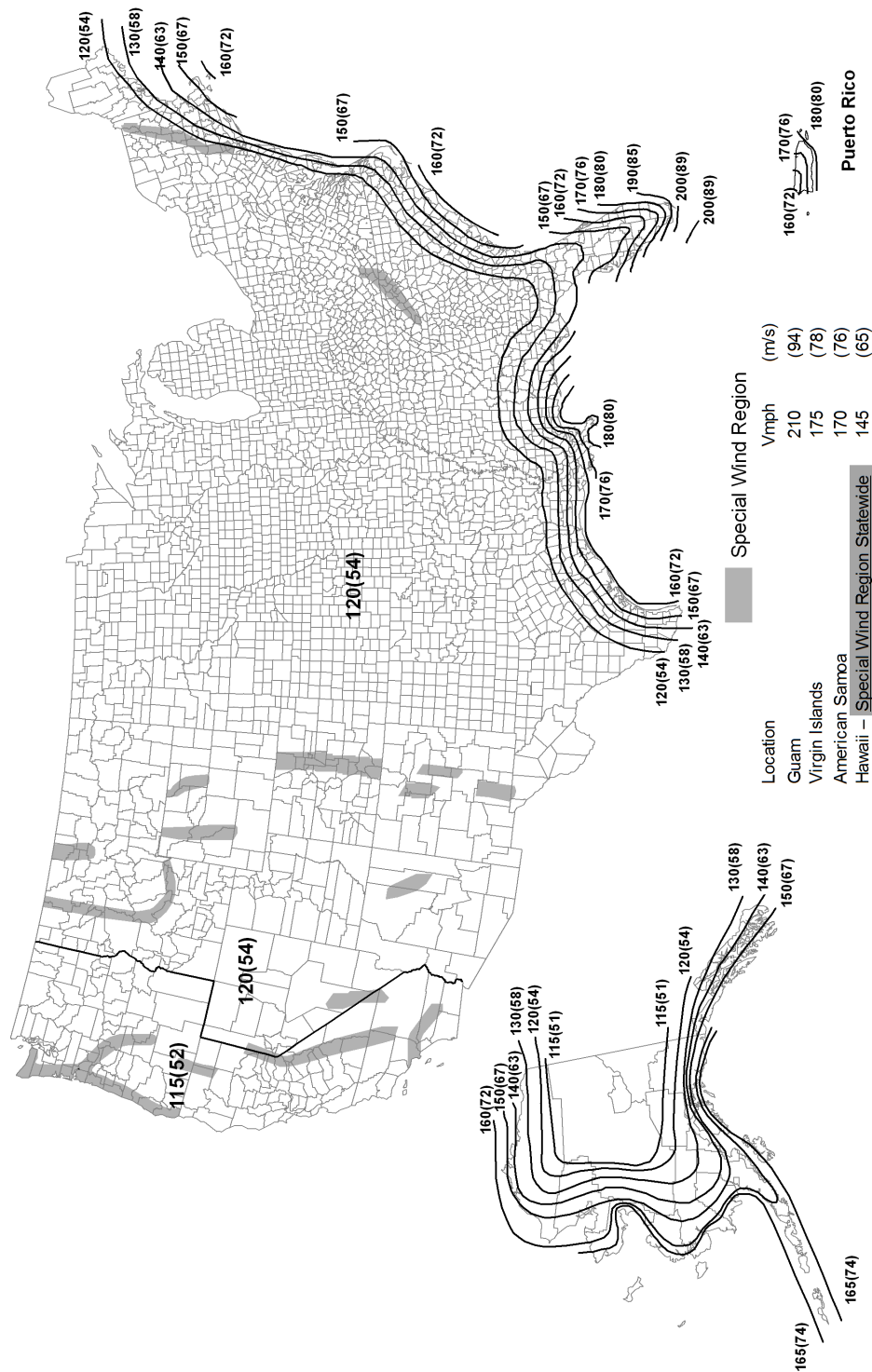
Concrete and clay roof tiles complying with the following limitations shall be designed to withstand the aerodynamic uplift moment as determined by this section.



Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.
2. Linear interpolation between contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00143, MRI = 700 Years).

FIGURE 1609.3(1)
ULTIMATE DESIGN WIND SPEEDS, v_{ult} FOR RISK CATEGORY II BUILDINGS AND OTHER STRUCTURES



Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.
2. Linear interpolation between contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 3% probability of exceedance in 50 years (Annual Exceedance Probability = 0.000588, MRI = 1700 Years).

FIGURE 1609.3(2) ULTIMATE DESIGN WIND SPEEDS, V_u , FOR RISK CATEGORY III AND IV BUILDINGS AND OTHER STRUCTURES

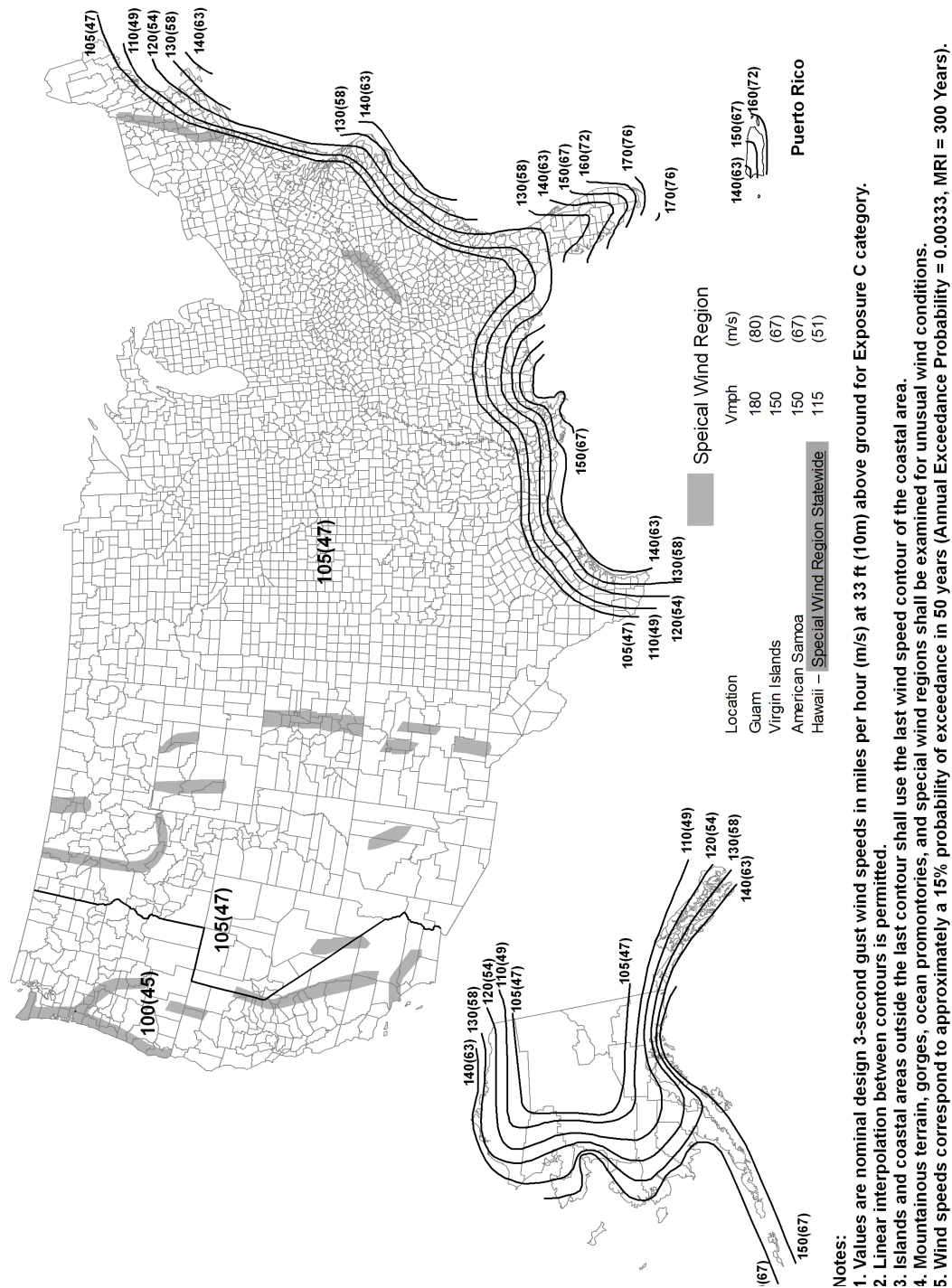


FIGURE 1609.3(3)
ULTIMATE DESIGN WIND SPEEDS, V_{uir} FOR RISK CATEGORY I BUILDINGS AND OTHER STRUCTURES

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.

a. Linear interpolation is permitted.

b. V_{asd} = nominal design wind speed applicable to methods specified in Exceptions 1 through 5 of Section 1609.1.1.

c. V_{ult} = ultimate design wind speeds determined from Figure 1609.3(1), 1609.3(2) or 1609.3(3).

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 Alternate all-heights method. The alternate wind design provisions in this section are simplifications of the ASCE 7 Directional Procedure.

1609.6.1 Scope. As an alternative to ASCE 7 Chapters 27 and 30, the following provisions are permitted to be used to determine the wind effects on regularly shaped buildings, or other structures that are regularly shaped, that meet all of the following conditions:

1. The building or other structure is less than or equal to 75 feet (22 860 mm) in height with a height-to-least-width ratio of 4 or less, or the building or other structure has a fundamental frequency greater than or equal to 1 hertz.
2. The building or other structure is not sensitive to dynamic effects.
3. The building or other structure is not located on a site for which channeling effects or buffeting in the wake of upwind obstructions warrant special consideration.
4. The building shall meet the requirements of a simple diaphragm building as defined in ASCE 7 Section 26.2, where wind loads are only transmitted to the main windforce-resisting system (MWFRS) at the diaphragms.
5. For open buildings, multispans gable roofs, stepped roofs, sawtooth roofs, domed roofs, roofs with

slopes greater than 45 degrees (0.79 rad), solid free-standing walls and solid signs, and rooftop equipment, apply ASCE 7 provisions.

1609.6.1.1 Modifications. The following modifications shall be made to certain subsections in ASCE 7: in Section 1609.6.2, symbols and notations that are specific to this section are used in conjunction with the symbols and notations in ASCE 7 Section 26.3.

1609.6.2 Symbols and notations. Coefficients and variables used in the alternative all-heights method equations are as follows:

C_{net} = Net-pressure coefficient based on $K_d [(G) (C_p) - (GC_{pi})]$, in accordance with Table 1609.6.2.

G = Gust effect factor for rigid structures in accordance with ASCE 7 Section 26.9.1.

K_d = Wind directionality factor in accordance with ASCE 7 Table 26-6.

P_{net} = Design wind pressure to be used in determination of wind loads on buildings or other structures or their components and cladding, in psf (kN/m²).

1609.6.3 Design equations. When using the alternative all-heights method, the MWFRS, and components and cladding of every structure shall be designed to resist the effects of wind pressures on the building envelope in accordance with Equation 16-35.

$$P_{net} = 0.00256V^2 K_z C_{net} K_{zt} \quad \text{(Equation 16-35)}$$

Design wind forces for the MWFRS shall be not less than 16 psf (0.77 kN/m²) multiplied by the area of the structure projected on a plane normal to the assumed wind direction (see ASCE 7 Section 27.4.7 for criteria). Design net wind pressure for components and cladding shall be not less than 16 psf (0.77 kN/m²) acting in either direction normal to the surface.

1609.6.4 Design procedure. The MWFRS and the components and cladding of every building or other structure shall be designed for the pressures calculated using Equation 16-35.

1609.6.4.1 Main windforce-resisting systems. The MWFRS shall be investigated for the torsional effects identified in ASCE 7 Figure 27.4-8.

1609.6.4.2 Determination of K_z and K_{zt} . Velocity pressure exposure coefficient, K_z , shall be determined in accordance with ASCE 7 Section 27.3.1 and the topo-

TABLE 1609.6.2
NET PRESSURE COEFFICIENTS, $C_{net}^{a, b}$

| STRUCTURE OR PART THEREOF | DESCRIPTION | | C_{net} FACTOR | | | |
|--|--|-------------|------------------------------|----------------------------|----------------------------|----------------------------|
| | | | Enclosed | | Partially enclosed | |
| 1. Main windforce-resisting frames and systems | Walls: | | + Internal pressure | - Internal pressure | + Internal pressure | - Internal pressure |
| | Windward wall | | 0.43 | 0.73 | 0.11 | 1.05 |
| | Leeward wall | | -0.51 | -0.21 | -0.83 | 0.11 |
| | Sidewall | | -0.66 | -0.35 | -0.97 | -0.04 |
| | Parapet wall | Windward | 1.28 | | 1.28 | |
| | | Leeward | -0.85 | | -0.85 | |
| | Roofs: | | Enclosed | | Partially enclosed | |
| | Wind perpendicular to ridge | | + Internal pressure | - Internal pressure | + Internal pressure | - Internal pressure |
| | Leeward roof or flat roof | | -0.66 | -0.35 | -0.97 | -0.04 |
| | Windward roof slopes: | | | | | |
| | Slope < 2:12 (10°) | Condition 1 | -1.09 | -0.79 | -1.41 | -0.47 |
| | | Condition 2 | -0.28 | 0.02 | -0.60 | 0.34 |
| | Slope = 4:12 (18°) | Condition 1 | -0.73 | -0.42 | -1.04 | -0.11 |
| | | Condition 2 | -0.05 | 0.25 | -0.37 | 0.57 |
| | Slope = 5:12 (23°) | Condition 1 | -0.58 | -0.28 | -0.90 | 0.04 |
| | | Condition 2 | 0.03 | 0.34 | -0.29 | 0.65 |
| | Slope = 6:12 (27°) | Condition 1 | -0.47 | -0.16 | -0.78 | 0.15 |
| | | Condition 2 | 0.06 | 0.37 | -0.25 | 0.68 |
| | Slope = 7:12 (30°) | Condition 1 | -0.37 | -0.06 | -0.68 | 0.25 |
| | | Condition 2 | 0.07 | 0.37 | -0.25 | 0.69 |
| | Slope = 9:12 (37°) | Condition 1 | -0.27 | 0.04 | -0.58 | 0.35 |
| | | Condition 2 | 0.14 | 0.44 | -0.18 | 0.76 |
| | Slope = 12:12 (45°) | | 0.14 | 0.44 | -0.18 | 0.76 |
| | Wind parallel to ridge and flat roofs | | -1.09 | -0.79 | -1.41 | -0.47 |
| | Nonbuilding Structures: Chimneys, Tanks and Similar Structures: | | | | | |
| | | | h/D | | | |
| | | | 1 | 7 | 25 | |
| | Square (Wind normal to face) | | 0.99 | 1.07 | 1.53 | |
| | Square (Wind on diagonal) | | 0.77 | 0.84 | 1.15 | |
| | Hexagonal or octagonal | | 0.81 | 0.97 | 1.13 | |
| | Round | | 0.65 | 0.81 | 0.97 | |
| | Open signs and lattice frameworks | | Ratio of solid to gross area | | | |
| | | | < 0.1 | 0.1 to 0.29 | 0.3 to 0.7 | |
| | Flat | | 1.45 | 1.30 | 1.16 | |
| | Round | | 0.87 | 0.94 | 1.08 | |

(continued)

TABLE 1609.6.2—continued
NET PRESSURE COEFFICIENTS, C_{net} ^{a, b}

| STRUCTURE OR PART THEREOF | DESCRIPTION | | C_{net} FACTOR | |
|--|--|-------------------------|------------------|---------------------------|
| | | | Enclosed | Partially enclosed |
| 2. Components and cladding not in areas of discontinuity—roofs and overhangs | Roof elements and slopes | | Enclosed | Partially enclosed |
| | Gable of hipped configurations (Zone 1) | | | |
| | Flat < Slope < 6:12 (27°) See ASCE 7 Figure 30.4-2B Zone 1 | | | |
| | Positive | 10 square feet or less | 0.58 | 0.89 |
| | | 100 square feet or more | 0.41 | 0.72 |
| | Negative | 10 square feet or less | -1.00 | -1.32 |
| | | 100 square feet or more | -0.92 | -1.23 |
| | Overhang: Flat < Slope < 6:12 (27°) See ASCE 7 Figure 30.4-2A Zone 1 | | | |
| | Negative | 10 square feet or less | -1.45 | |
| | | 100 square feet or more | -1.36 | |
| | | 500 square feet or more | -0.94 | |
| | 6:12 (27°) < Slope < 12:12 (45°) See ASCE 7 Figure 30.4-2C Zone 1 | | | |
| | Positive | 10 square feet or less | 0.92 | 1.23 |
| | | 100 square feet or more | 0.83 | 1.15 |
| | Negative | 10 square feet or less | -1.00 | -1.32 |
| | | 100 square feet or more | -0.83 | -1.15 |
| | Monosloped configurations (Zone 1) | | Enclosed | Partially enclosed |
| | Flat < Slope < 7:12 (30°) See ASCE 7 Figure 30.4-5B Zone 1 | | | |
| | Positive | 10 square feet or less | 0.49 | 0.81 |
| | | 100 square feet or more | 0.41 | 0.72 |
| | Negative | 10 square feet or less | -1.26 | -1.57 |
| | | 100 square feet or more | -1.09 | -1.40 |
| | Tall flat-topped roofs $h > 60$ feet | | Enclosed | Partially enclosed |
| | Flat < Slope < 2:12 (10°) (Zone 1) See ASCE 7 Figure 30.8-1 Zone 1 | | | |
| | Negative | 10 square feet or less | -1.34 | -1.66 |
| | | 500 square feet or more | -0.92 | -1.23 |
| 3. Components and cladding in areas of discontinuity—roofs and overhangs (continued) | Gable or hipped configurations at ridges, eaves and rakes (Zone 2) | | | |
| | Flat < Slope < 6:12 (27°) See ASCE 7 Figure 30.4-2B Zone 2 | | | |
| | Positive | 10 square feet or less | 0.58 | 0.89 |
| | | 100 square feet or more | 0.41 | 0.72 |
| | Negative | 10 square feet or less | -1.68 | -2.00 |
| | | 100 square feet or more | -1.17 | -1.49 |
| | Overhang for Slope Flat < Slope < 6:12 (27°) See ASCE 7 Figure 30.4-2B Zone 2 | | | |
| | Negative | 10 square feet or less | -1.87 | |
| | | 100 square feet or more | -1.87 | |
| | 6:12 (27°) < Slope < 12:12 (45°) Figure 30.4-2C | | Enclosed | Partially enclosed |
| | Positive | 10 square feet or less | 0.92 | 1.23 |
| | | 100 square feet or more | 0.83 | 1.15 |
| | Negative | 10 square feet or less | -1.17 | -1.49 |
| | | 100 square feet or more | -1.00 | -1.32 |
| | Overhang for 6:12 (27°) < Slope < 12:12 (45°) See ASCE 7 Figure 30.4-2C Zone 2 | | | |
| | Negative | 10 square feet or less | -1.70 | |
| | | 500 square feet or more | -1.53 | |

(continued)

TABLE 1609.6.2—continued
NET PRESSURE COEFFICIENTS, $C_{net}^{a, b}$

| STRUCTURE OR PART THEREOF | DESCRIPTION | C _{net} FACTOR | | |
|---|---|-------------------------|--------------------|--------------------|
| 3. Components and cladding in areas of discontinuity—roofs and overhangs | Roof elements and slopes | Enclosed | Partially enclosed | |
| | Monosloped configurations at ridges, eaves and rakes (Zone 2) | | | |
| | Flat < Slope < 7:12 (30°) See ASCE 7 Figure 30.4-5B Zone 2 | | | |
| | Positive | 10 square feet or less | 0.49 | 0.81 |
| | | 100 square feet or more | 0.41 | 0.72 |
| | Negative | 10 square feet or less | -1.51 | -1.83 |
| | | 100 square feet or more | -1.43 | -1.74 |
| | Tall flat topped roofs <i>h</i> > 60 feet | | Enclosed | Partially enclosed |
| | Flat < Slope < 2:12 (10°) (Zone 2) See ASCE 7 Figure 30.8-1 Zone 2 | | | |
| | Negative | 10 square feet or less | -2.11 | -2.42 |
| | | 500 square feet or more | -1.51 | -1.83 |
| | Gable or hipped configurations at corners (Zone 3) See ASCE 7 Figure 30.4-2B Zone 3 | | | |
| | Flat < Slope < 6:12 (27°) | | Enclosed | Partially enclosed |
| | Positive | 10 square feet or less | 0.58 | 0.89 |
| | | 100 square feet or more | 0.41 | 0.72 |
| | Negative | 10 square feet or less | -2.53 | -2.85 |
| | | 100 square feet or more | -1.85 | -2.17 |
| | Overhang for Slope Flat < Slope < 6:12 (27°) See ASCE 7 Figure 30.4-2B Zone 3 | | | |
| | Negative | 10 square feet or less | -3.15 | |
| | | 100 square feet or more | -2.13 | |
| | 6:12 (27°) < 12:12 (45°) See ASCE 7 Figure 30.4-2C Zone 3 | | | |
| | Positive | 10 square feet or less | 0.92 | 1.23 |
| | | 100 square feet or more | 0.83 | 1.15 |
| | Negative | 10 square feet or less | -1.17 | -1.49 |
| | | 100 square feet or more | -1.00 | -1.32 |
| | Overhang for 6:12 (27°) < Slope < 12:12 (45°) | | Enclosed | Partially enclosed |
| | Negative | 10 square feet or less | -1.70 | |
| | | 100 square feet or more | -1.53 | |
| | Monosloped Configurations at corners (Zone 3) See ASCE 7 Figure 30.4-5B Zone 3 | | | |
| | Flat < Slope < 7:12 (30°) | | | |
| | Positive | 10 square feet or less | 0.49 | 0.81 |
| | | 100 square feet or more | 0.41 | 0.72 |
| | Negative | 10 square feet or less | -2.62 | -2.93 |
| | | 100 square feet or more | -1.85 | -2.17 |
| | Tall flat topped roofs <i>h</i> > 60 feet | | Enclosed | Partially enclosed |
| | Flat < Slope < 2:12 (10°) (Zone 3) See ASCE 7 Figure 30.8-1 Zone 3 | | | |
| | Negative | 10 square feet or less | -2.87 | -3.19 |
| | | 500 square feet or more | -2.11 | -2.42 |
| 4. Components and cladding not in areas of discontinuity—walls and parapets (continued) | Wall Elements: <i>h</i> ≤ 60 feet (Zone 4) ASCE 7 Figure 30.4-1 | | Enclosed | Partially enclosed |
| | Positive | 10 square feet or less | 1.00 | 1.32 |
| | | 500 square feet or more | 0.75 | 1.06 |
| | Negative | 10 square feet or less | -1.09 | -1.40 |
| | | 500 square feet or more | -0.83 | -1.15 |
| | Wall Elements: <i>h</i> > 60 feet (Zone 4) See ASCE 7 Figure 30.6-1 Zone 4 | | | |
| | Positive | 20 square feet or less | 0.92 | 1.23 |
| | | 500 square feet or more | 0.66 | 0.98 |

(continued)

TABLE 1609.6.2—continued
NET PRESSURE COEFFICIENTS, C_{net} ^{a, b}

| STRUCTURE OR PART THEREOF | DESCRIPTION | | C_{net} FACTOR | |
|---|---|-------------------------|------------------|---------------------------|
| 4. Components and cladding not in areas of discontinuity—walls and parapets | Negative | 20 square feet or less | -0.92 | -1.23 |
| | | 500 square feet or more | -0.75 | -1.06 |
| | Parapet Walls | | | |
| | Positive | | 2.87 | 3.19 |
| | Negative | | -1.68 | -2.00 |
| 5. Components and cladding in areas of discontinuity—walls and parapets | Wall elements: $h \leq 60$ feet (Zone 5) ASCE 7 Figure 30.4-1 | | Enclosed | Partially enclosed |
| | Positive | 10 square feet or less | 1.00 | 1.32 |
| | | 500 square feet or more | 0.75 | 1.06 |
| | Negative | 10 square feet or less | -1.34 | -1.66 |
| | | 500 square feet or more | -0.83 | -1.15 |
| | Wall elements: $h > 60$ feet (Zone 5) See ASCE 7 Figure 30.6-1 Zone 4 | | | |
| | Positive | 20 square feet or less | 0.92 | 1.23 |
| | | 500 square feet or more | 0.66 | 0.98 |
| | Negative | 20 square feet or less | -1.68 | -2.00 |
| | | 500 square feet or more | -1.00 | -1.32 |
| | Parapet walls | | | |
| | Positive | | 3.64 | 3.95 |
| | Negative | | -2.45 | -2.76 |

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929m², 1 degree = 0.0175 rad.

a. Linear interpolation between values in the table is permitted.

b. Some C_{net} values have been grouped together. Less conservative results may be obtained by applying ASCE 7 provisions.

TABLE 1610.1
LATERAL SOIL LOAD

| DESCRIPTION OF BACKFILL MATERIAL ^c | UNIFIED SOIL CLASSIFICATION | 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 mixes | SP | 30 | 60 |
| 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.

a. 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.

b. Unsuitable as backfill material.

c. The definition and classification of soil materials shall be in accordance with ASTM D2487.

graphic factor, K_{zt} , shall be determined in accordance with ASCE 7 Section 26.8.

1. For the windward side of a structure, K_{zt} and K_z shall be based on height z .
2. For leeward and sidewalls, and for windward and leeward roofs, K_{zt} and K_z shall be based on mean roof height h .

1609.6.4.3 Determination of net pressure coefficients, C_{net} . For the design of the MWFRS and for components and cladding, the sum of the internal and external net pressure shall be based on the net pressure coefficient, C_{net} .

1. The pressure coefficient, C_{net} , for walls and roofs shall be determined from Table 1609.6.2.
2. Where C_{net} has more than one value, the more severe wind load condition shall be used for design.

1609.6.4.4 Application of wind pressures. When using the alternative all-heights method, wind pressures shall be applied simultaneously on, and in a direction normal to, all building envelope wall and roof surfaces.

1609.6.4.4.1 Components and cladding. Wind pressure for each component or cladding element is applied as follows using C_{net} values based on the effective wind area, A , contained within the zones in areas of discontinuity of width and/or length “a,” “2a” or “4a” at: corners of roofs and walls; edge strips for ridges, rakes and eaves; or field areas on walls or roofs as indicated in figures in tables in ASCE 7 as referenced in Table 1609.6.2 in accordance with the following:

1. Calculated pressures at local discontinuities acting over specific edge strips or corner boundary areas.
2. Include “field” (Zone 1, 2 or 4, as applicable) pressures applied to areas beyond the boundaries of the areas of discontinuity.
3. Where applicable, the calculated pressures at discontinuities (Zone 2 or 3) shall be combined with design pressures that apply specifically on rakes or eave overhangs.

SECTION 1610 SOIL LATERAL LOADS

1610.1 General. Foundation walls and retaining walls shall be designed to resist lateral soil loads. 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. Design lateral pressure from surcharge loads shall be added to the lateral earth pressure load. Design lateral pressure shall be increased if soils at the site are expansive. 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.

SECTION 1611 RAIN LOADS

1611.1 Design rain loads. Each portion of a roof shall be designed to sustain the load of rainwater that will accumulate on it if the primary drainage system for that portion is blocked plus the uniform load caused by water that rises above the inlet of the secondary drainage system at its design flow. The design rainfall shall be based on the 100-year hourly rainfall rate indicated in Figure 1611.1 or on other rainfall rates determined from *approved* local weather data.

$$R = 5.2(d_s + d_h) \quad (\text{Equation 16-36})$$

For SI: $R = 0.0098(d_s + d_h)$

where:

d_h = Additional depth of water on the undeflected roof above the inlet of secondary drainage system at its design flow (i.e., the hydraulic head), in inches (mm).

d_s = Depth of water on the undeflected roof up to the inlet of secondary drainage system when the primary drainage system is blocked (i.e., the static head), in inches (mm).

R = Rain load on the undeflected roof, in psf (kN/m²). When the phrase “undeflected roof” is used, deflections from loads (including dead loads) shall not be considered when determining the amount of rain on the roof.

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 accu-

mulation 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.

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. *Flood hazard areas* are established by the *Floodplain Administrator* pursuant to 20 DCMR, Chapter 31.

1612.3.1 Design flood elevations. Where design flood elevations are not included in the *flood hazard areas*

established in 20 DCMR, Chapter 31, or where floodways are not designated, the *owner* and/or the *owner's registered design professional* shall provide a design floodway analysis and a floodplain analysis to develop design flood elevations. These analyses will be referred to the *Floodplain Administrator* for review and approval.

1612.3.2 Determination of impacts. In riverine *flood hazard areas* where design flood elevations are specified but floodways have not been designated, the permit 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 District of Columbia. This analysis shall be referred to the *Floodplain Administrator* for review and approval.

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 ASCE 24.

1612.4.1 Minimum elevation. Minimum elevation of the top of lowest floor and floodproofing of all classes of buildings and structures shall be 2 feet (610 mm) above the Base Flood Elevation, or 500-year flood elevation, whichever is higher.

1612.4.2 ASCE 24-14. Table 2-1 and Table 6-1 of ASCE 24-14 do not apply in the District of Columbia.

1612.5 Flood hazard documentation. The following documentation shall be prepared and sealed by a *registered design professional* 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 110.3.3 and for the final inspection in Section 110.3.10.1.
 - 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.
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

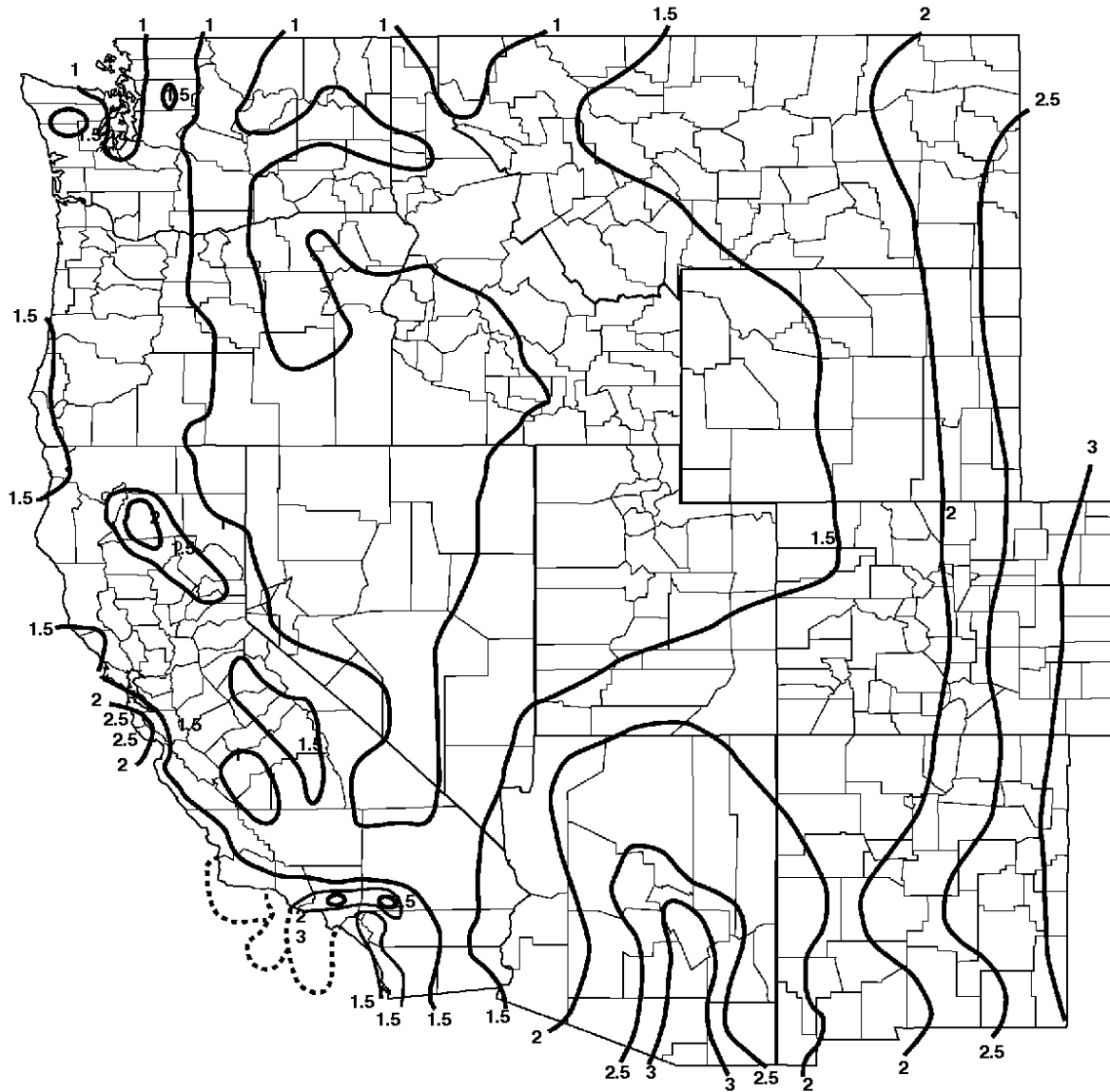


FIGURE 1611.1
100-YEAR, 1-HOUR RAINFALL (INCHES) WESTERN UNITED STATES

For SI: 1 inch = 25.4 mm.

Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington, DC.

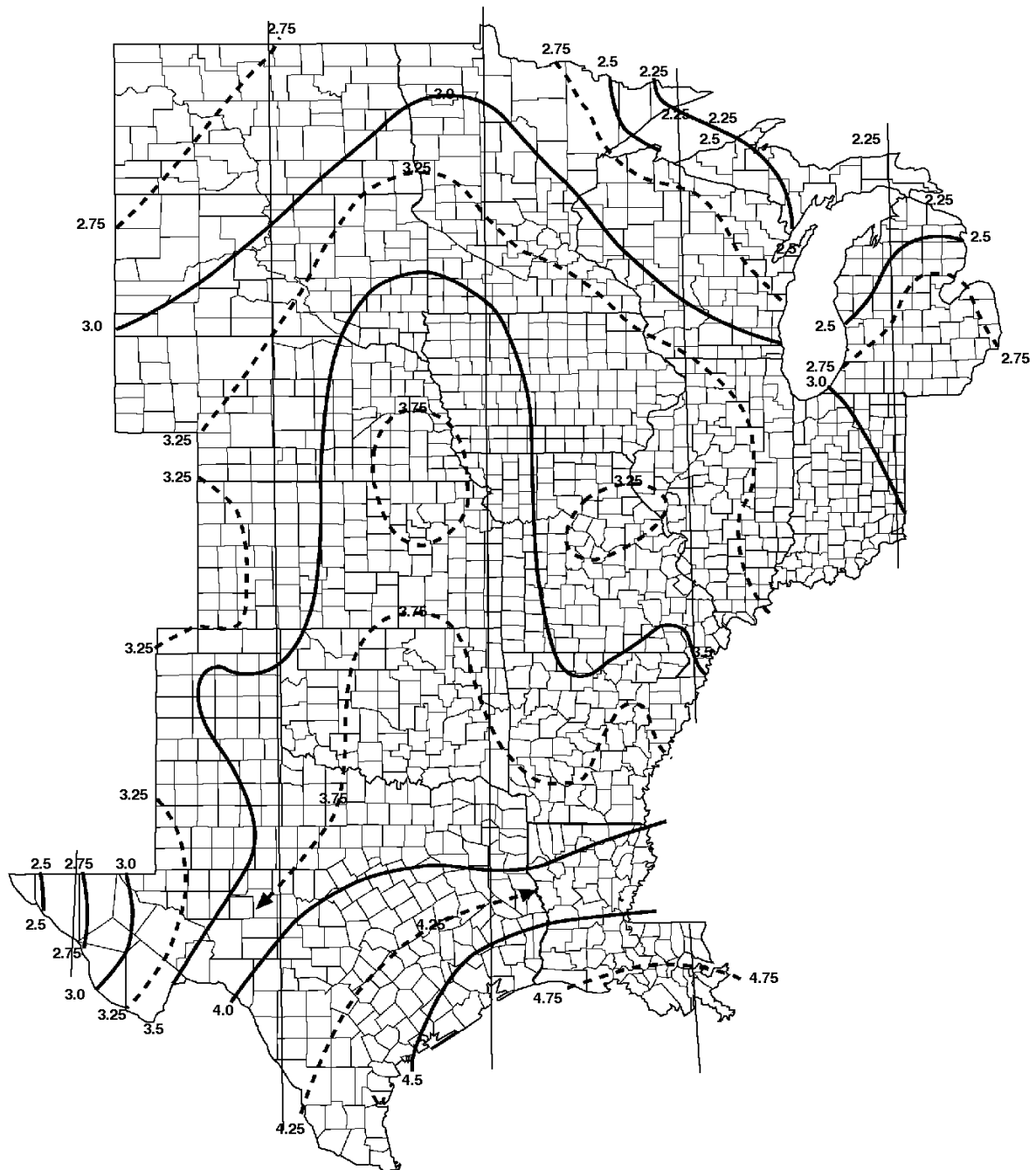


FIGURE 1611.1—continued
100-YEAR, 1-HOUR RAINFALL (INCHES) CENTRAL UNITED STATES

For SI: 1 inch = 25.4 mm.

Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington, DC.



FIGURE 1611.1—continued
100-YEAR, 1-HOUR RAINFALL (INCHES) EASTERN UNITED STATES

For SI: 1 inch = 25.4 mm.

Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington, DC.

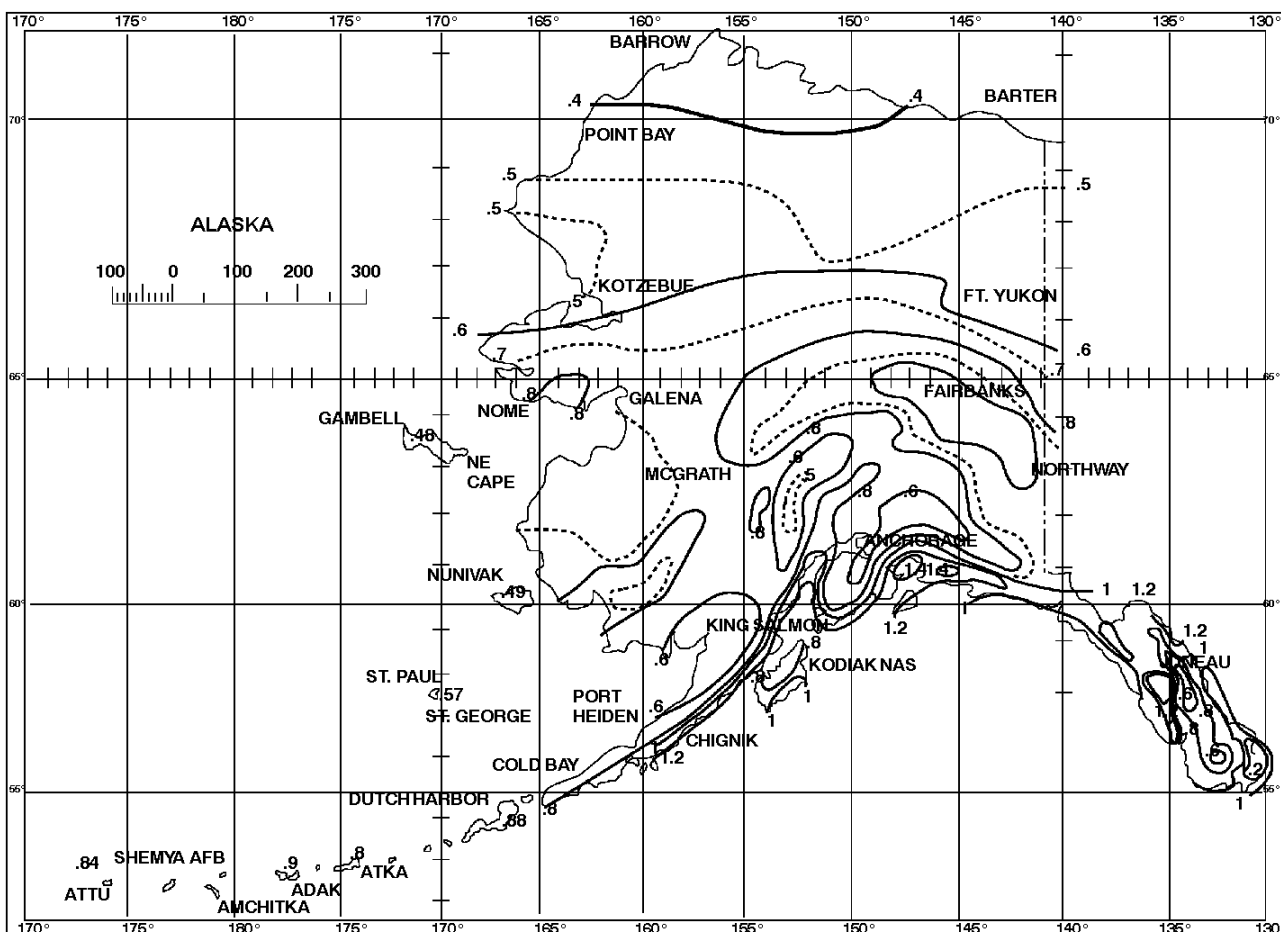


FIGURE 1611.1—continued
100-YEAR, 1-HOUR RAINFALL (INCHES) ALASKA

For SI: 1 inch = 25.4 mm.

Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington, DC.

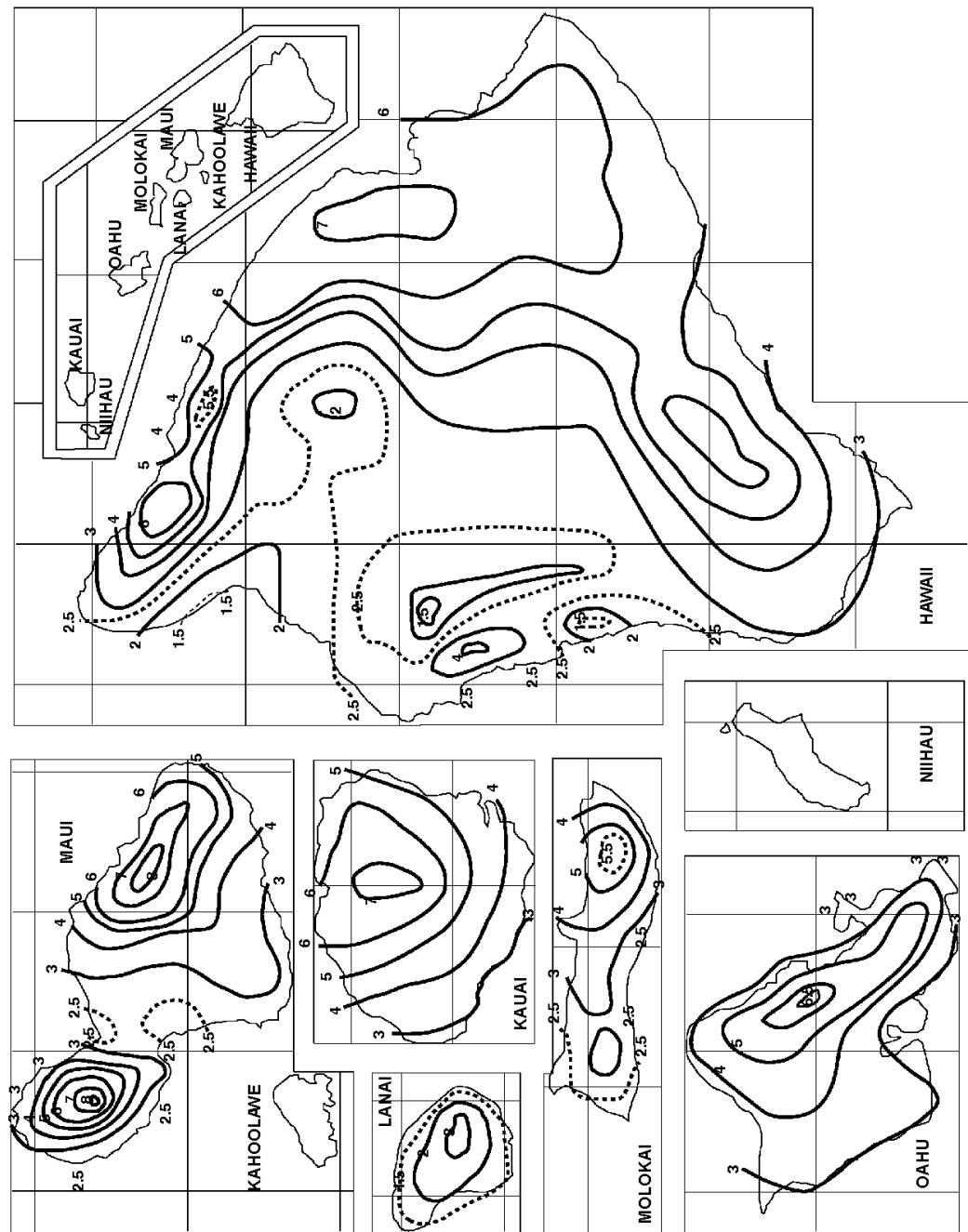


FIGURE 1611.1—continued
100-YEAR, 1-HOUR RAINFALL (INCHES) HAWAII

For SI: 1 inch = 25.4 mm.
Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington, DC.

lowest floor elevation inspection in Section 110.3.3 and for the final inspection in Section 110.3.10.1.

- 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/m²) determined using allowable stress design, *construction documents* shall include a statement that the breakaway wall is designed in accordance with ASCE 24.

SECTION 1613 EARTHQUAKE LOADS

1613.1 Scope. Every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with ASCE 7, excluding Chapter 14 and Appendix 11A. The *seismic design category* for a structure is permitted to be determined in accordance with Section 1613 or ASCE 7.

Exceptions:

1. Detached one- and two-family dwellings, assigned to *Seismic Design Category* A, B or C, or located where the mapped short-period spectral response acceleration, S_s , is less than 0.4 g.
2. The seismic force-resisting system of wood-frame buildings that conform to the provisions of Section 2308 are not required to be analyzed as specified in this section.
3. Agricultural storage structures intended only for incidental human occupancy.

4. Structures that require special consideration of their response characteristics and environment that are not addressed by this code or ASCE 7 and for which other regulations provide seismic criteria, such as vehicular bridges, electrical transmission towers, hydraulic structures, buried utility lines and their appurtenances and nuclear reactors.

1613.2 Definitions. The following terms are defined in Chapter 2:

**DESIGN EARTHQUAKE GROUND MOTION.
ORTHOGONAL.**

**RISK-TARGETED MAXIMUM CONSIDERED
EARTHQUAKE (MCE_R) GROUND MOTION
RESPONSE ACCELERATION.**

SEISMIC DESIGN CATEGORY.

SEISMIC FORCE-RESISTING SYSTEM.

SITE CLASS.

SITE COEFFICIENTS.

1613.3 Seismic ground motion values. Seismic ground motion values shall be determined in accordance with this section.

1613.3.1 Mapped acceleration parameters. The parameters S_s and S_1 shall be determined from the 0.2 and 1-second spectral response accelerations shown on Figures 1613.3.1(1) through 1613.3.1(8). Where S_1 is less than or equal to 0.04 and S_s is less than or equal to 0.15, the structure is permitted to be assigned *Seismic Design Category* A.

1613.3.2 Site class definitions. Based on the site soil properties, the site shall be classified as *Site Class* A, B, C, D, E or F in accordance with Chapter 20 of ASCE 7.

Where the soil properties are not known in sufficient detail to determine the site class, *Site Class* D shall be used unless the building official or geotechnical data determines *Site Class* E or F soils are present at the site.

1613.3.3 Site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters. The maximum considered earthquake spectral response acceleration for short periods, S_{MS} , and at 1-

**TABLE 1613.3.3(1)
VALUES OF SITE COEFFICIENT F_a ^a**

| SITE CLASS | MAPPED SPECTRAL RESPONSE ACCELERATION AT SHORT PERIOD | | | | |
|------------|---|--------------|--------------|--------------|-----------------|
| | $S_s \leq 0.25$ | $S_s = 0.50$ | $S_s = 0.75$ | $S_s = 1.00$ | $S_s \geq 1.25$ |
| A | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |
| B | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| C | 1.2 | 1.2 | 1.1 | 1.0 | 1.0 |
| D | 1.6 | 1.4 | 1.2 | 1.1 | 1.0 |
| E | 2.5 | 1.7 | 1.2 | 0.9 | 0.9 |
| F | Note b | Note b | Note b | Note b | Note b |

a. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at short period, S_s .

TABLE 1613.3.3(2)
VALUES OF SITE COEFFICIENT F_v ^a

| SITE CLASS | MAPPED SPECTRAL RESPONSE ACCELERATION AT 1-SECOND PERIOD | | | | |
|------------|--|-------------|-------------|-------------|----------------|
| | $S_1 \leq 0.1$ | $S_1 = 0.2$ | $S_1 = 0.3$ | $S_1 = 0.4$ | $S_1 \geq 0.5$ |
| A | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |
| B | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| C | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 |
| D | 2.4 | 2.0 | 1.8 | 1.6 | 1.5 |
| E | 3.5 | 3.2 | 2.8 | 2.4 | 2.4 |
| F | Note b | Note b | Note b | Note b | Note b |

a. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at 1-second period, S_1 .

b. Values shall be determined in accordance with Section 11.4.7 of ASCE 7.

second period, S_{M1} , adjusted for *site class* effects shall be determined by Equations 16-37 and 16-38, respectively:

$$S_{MS} = F_a S_s \quad \text{(Equation 16-37)}$$

$$S_{M1} = F_v S_1 \quad \text{(Equation 16-38)}$$

where:

F_a = Site coefficient defined in Table 1613.3.3(1).

F_v = Site coefficient defined in Table 1613.3.3(2).

S_s = The mapped spectral accelerations for short periods as determined in Section 1613.3.1.

S_1 = The mapped spectral accelerations for a 1-second period as determined in Section 1613.3.1.

1613.3.4 Design spectral response acceleration parameters. Five-percent damped design spectral response acceleration at short periods, S_{DS} , and at 1-second period, S_{D1} , shall be determined from Equations 16-39 and 16-40, respectively:

$$S_{DS} = \frac{2}{3} S_{MS} \quad \text{(Equation 16-39)}$$

$$S_{D1} = \frac{2}{3} S_{M1} \quad \text{(Equation 16-40)}$$

where:

S_{MS} = The maximum considered earthquake spectral response accelerations for short period as determined in Section 1613.3.3.

S_{M1} = The maximum considered earthquake spectral response accelerations for 1-second period as determined in Section 1613.3.3.

1613.3.5 Determination of seismic design category. Structures classified as *Risk Category* I, II or III that are located where the mapped spectral response acceleration parameter at 1-second period, S_1 , is greater than or equal to 0.75 shall be assigned to *Seismic Design Category* E. Structures classified as *Risk Category* IV that are located where the mapped spectral response acceleration parameter at 1-second period, S_1 , is greater than or equal to 0.75 shall be assigned to *Seismic Design Category* F. All other structures shall be assigned to a *seismic design category* based on their *risk category* and the design spectral response acceleration parameters, S_{DS} and S_{D1} , determined

in accordance with Section 1613.3.4 or the site-specific procedures of ASCE 7. Each building and structure shall be assigned to the more severe *seismic design category* in accordance with Table 1613.3.5(1) or 1613.3.5(2), irrespective of the fundamental period of vibration of the structure, T .

1613.3.5.1 Alternative seismic design category determination. Where S_1 is less than 0.75, the *seismic design category* is permitted to be determined from Table 1613.3.5(1) alone when all of the following apply:

1. In each of the two orthogonal directions, the approximate fundamental period of the structure, T_a , in each of the two orthogonal directions determined in accordance with Section 12.8.2.1 of ASCE 7, is less than $0.8 T_s$ determined in accordance with Section 11.4.5 of ASCE 7.
2. In each of the two orthogonal directions, the fundamental period of the structure used to calculate the story drift is less than T_s .
3. Equation 12.8-2 of ASCE 7 is used to determine the seismic response coefficient, C_s .
4. The diaphragms are rigid or are permitted to be idealized as rigid in accordance with Section 12.3.1 of ASCE 7 or, for diaphragms permitted to be idealized as flexible in accordance with Section 12.3.1 of ASCE 7, the distances between vertical elements of the seismic force-resisting system do not exceed 40 feet (12 192 mm).

1613.3.5.2 Simplified design procedure. Where the alternate simplified design procedure of ASCE 7 is used, the *seismic design category* shall be determined in accordance with ASCE 7.

1613.4 Alternatives to ASCE 7. The provisions of Section 1613.4 shall be permitted as alternatives to the relevant provisions of ASCE 7.

1613.4.1 Additional seismic force-resisting systems for seismically isolated structures. Add the following exception to the end of Section 17.5.4.2 of ASCE 7:

Exception: For isolated structures designed in accordance with this standard, the structural system limitations including structural height limits, in Table 12.2-1

for ordinary steel concentrically braced frames (OCBFs) as defined in Chapter 11 and ordinary moment frames (OMFs) as defined in Chapter 11 are permitted to be taken as 160 feet (48 768 mm) for structures assigned to *Seismic Design Category D, E or F*, provided that the following conditions are satisfied:

1. The value of R_f as defined in Chapter 17 is taken as 1.
2. For OMFs and OCBFs, design is in accordance with AISC 341.

1613.5 Amendments to ASCE 7. The provisions of Section 1613.5 shall be permitted as an amendment to the relevant provisions of ASCE 7.

1613.5.1 Transfer of anchorage forces into diaphragm. Modify ASCE 7 Section 12.11.2.2.1 as follows:

12.11.2.2.1 Transfer of anchorage forces into diaphragm. Diaphragms shall be provided with continuous ties or struts between diaphragm chords to distribute these anchorage forces into the diaphragms. Diaphragm connections shall be positive, mechanical or welded. Added chords are permitted to be used to form subdiaphragms to transmit the anchorage forces to the main continuous cross-ties. The maximum length-to-width ratio of a wood, wood structural panel or untopped steel deck sheathed structural subdiaphragm that serves as part of the continuous tie system shall be 2.5 to 1. Connections and anchorages capable of resisting the prescribed forces shall be provided between the diaphragm and the attached components. Connections shall extend into the diaphragm a sufficient distance to develop the force transferred into the diaphragm.

1613.6 Ballasted photovoltaic panel systems. Ballasted, roof-mounted *photovoltaic panel systems* need not be rigidly attached to the roof or supporting structure. Ballasted nonpenetrating systems shall be designed and installed only on roofs with slopes not more than one unit vertical in 12 units horizontal. Ballasted nonpenetrating systems shall be designed to resist sliding and uplift resulting from lateral and vertical forces as required by Section 1605, using a coefficient of friction determined by acceptable engineering principles. In structures assigned to *Seismic Design Category C, D, E or F*, ballasted nonpenetrating systems shall be designed to accommodate seismic displacement determined by nonlinear response-history analysis or shake-table testing, using input motions consistent with ASCE 7 lateral and vertical seismic forces for nonstructural components on roofs.

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. Bearing wall structures shall comply with the requirements of Section 1615.4.

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