Cayman Islands Building Code

DEVELOPMENT AND PLANNING LAW (2005 Revision)

BUILDING CODE REGULATIONS (2006 Revision)
CHAPTER 1
ADMINISTRATION

SECTION 101
GENERAL

101.1 Scope. The provisions of this chapter shall govern the administration and enforcement of the Standard Building, Gas, Mechanical and Plumbing Codes, and the National Electrical Code, hereinafter referred to as the "technical codes," as may be adopted by the state or local jurisdiction.

101.2 Title. The provisions of the following chapters shall constitute and be known and be cited as the "Cayman Islands Building Code," hereinafter known as "this code."

101.3 Code remedial

101.3.1 General. This code is hereby declared to be remedial and shall be construed to secure the beneficial interests and purposes thereof, which are public safety, health, and general welfare through structural strength, stability, sanitation, adequate light and ventilation, and safety to life and property from fire and other hazards attributed to the built environment including alteration, repair, removal, demolition, use and occupancy of buildings, structures, or premises, and by regulating the installation and maintenance of all electrical, gas, mechanical and plumbing systems, which may be referred to as service systems.

101.3.2 Quality control. Quality control of materials and workmanship is not within the purview of this code except as it relates to the purposes stated herein.

101.3.3 Permitting and inspection. The inspection or permitting of any building, system or plan by any jurisdiction, under the requirements of this code, shall not be construed in any court as a warranty of the physical condition of such building, system or plan or their adequacy. No jurisdiction nor any employee thereof shall be liable in tort for damages for any defect or hazardous or illegal condition or inadequacy in such building, system or plan, nor for any failure of any component of such, which may occur subsequent to such inspection or permitting.

101.4 Applicability

101.4.1 General. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable.

101.4.2 Building.

101.4.3 Electrical.

101.4.4 Gas.

101.4.5 Mechanical.

101.4.6 Plumbing.

101.4.7 Federal and state authority.

101.4.8 Appendices. To be enforceable, the appendices included in the technical codes must be referenced in the code text or specifically included in the adopting ordinance.

101.4.9 Referenced standards. Standards referenced in the technical codes shall be considered an integral part of the codes without separate adoption. If specific portions of a standard are denoted by code text, only those portions of the standard shall be enforced. Where code provisions conflict with a standard, the code provisions shall be enforced. Permissive and advisory provisions in a standard shall not be construed as mandatory.
101.4.10 Units of measure. The inch-pound system of measurement is applicable to the provisions of this code. Metric units indicated in parenthesis following inch-pound units are approximate equivalents and are provided for informational purposes only.

SECTION 102
BUILDING DEPARTMENT

102.1 Establishment.

102.2 Employee qualifications
102.2.1 Building official qualifications.

102.2.2 Chief inspector qualifications.

102.23 Inspector qualifications.

102.4 Records.

102.5 Liability.

102.6 Reports.

SECTION 103
POWERS AND DUTIES OF THE BUILDING OFFICIAL

103.1 General. The building official is hereby authorized and directed to enforce the provisions of this code. The building official is further authorized to render interpretations of this code, which are consistent with its spirit and purpose.

103.2 Right of entry

102.4 Deputy building official qualifications.
103.3 Stop work orders.

103.4 Revocation of permits

103.4.1 Misrepresentation of application. The building official may revoke a permit or approval, issued under the provisions of this code, in case there has been any false statement or misrepresentation as to the material fact in the application or plans on which the permit or approval was based.

103A.2 Violation of code provisions. The building official may revoke a permit upon determination by the building official that the construction, erection, alteration, repair, moving, demolition, installation, or replacement of the building, structure, electrical, gas, mechanical or plumbing systems for which the permit was issued is in violation of, or not in conformity with, the provisions of this code.

103.5 Unsafe buildings or systems.

Conditions. Structures or existing equipment that are or hereafter become 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 occupancy or inadequate maintenance, shall be deemed an unsafe condition. Unsafe structures shall be taken down and removed or made safe, as the building official deems necessary and as provided for in this section. A vacant structure that is not secured against entry shall be deemed unsafe.

103.5a Record. The building official shall cause a report to be filed on an unsafe condition. The report shall state the occupancy of the structure and the nature of the unsafe condition. The report shall state the occupancy of the structure and the nature of the unsafe condition.

103.5b Notice. If an unsafe condition is found, the building official shall serve on the owner, agent or person in control of the structure, a written notice that describes the condition deemed unsafe and specifies the required repairs or improvements to be made to abate the unsafe condition, or that requires the unsafe structure to be demolished within a stipulated time. Such notice shall require the person thus notified to declare immediately to the building official acceptance or rejection of the terms of the notice.

103.5c Method of service. Such notice shall be deemed properly served if a copy thereof is -

(a) delivered to the owner personally;
(b) sent by certified or registered mail addressed to the owner at the last known address with the return receipt requested; or
(c) delivered in any other manner as prescribed by the Development and Planning Law (2005 Revision).

If the certified or registered letter is returned showing that the letter was not delivered, a copy thereof shall be posted in a conspicuous place in or about the structure affected by such notice. Service of such notice in the foregoing manner upon the owner’s agent or upon the person responsible for the structure shall constitute service of notice upon the owner.

103.5d Restoration. The structure or equipment determined to be unsafe by the building official is permitted to be restored to a safe condition. To the extent that repairs, alterations or additions are made or a change of occupancy occurs during the restoration of the structure, such repairs, alterations, additions or change of occupancy shall comply with the requirements of section 104.1.4 and Chapter 34.

103.6 Requirements not covered by code. Any requirements necessary for the strength, stability or proper operation of an existing or proposed building, structure, electrical, gas, mechanical or plumbing system, or for the public safety, health and general welfare, not specifically covered by this or the other technical codes, shall be determined by the building official.

103.7 Alternate materials and methods. The provisions of the technical codes are not intended to prevent the use of any material or method of construction not specifically prescribed by them, provided any such alternate has been reviewed by the building official. The building official shall approve any such alternate, provided the building official finds that the alternate for the purpose intended is at least the equivalent of that prescribed in the technical codes, in
quality, strength, effectiveness, fire resistance, durability and safety. The building official shall require that sufficient evidence or proof be submitted to substantiate any claim made regarding the alternate.

SECTION 104
PERMITS

104.1 Permit application
104.1.1 When required. Any owner, authorized agent, or contractor who desires to construct, enlarge, alter, repair, move, demolish, or change the occupancy of a building or structure, or to erect, install, enlarge, alter, repair, remove, convert or replace any electrical, gas, mechanical or plumbing system, the installation of which is regulated by the technical codes, or to cause any such work to be done, shall first make application to the building official and obtain the required permit for the work.

Exception: Permits shall not be required for the following mechanical work:
1. any portable heating appliance;
2. any portable ventilation equipment;
3. any portable cooling unit;
4. any steam, hot or chilled water piping within any heating or cooling equipment regulated by this code;
5. replacement of any part which does not alter its approval or make it unsafe;
6. any portable evaporative cooler;
7. any self-contained refrigeration system containing 10 lb (4.54 kg) or less of refrigerant and actuated by motors of 1 horsepower (746 W) or less.

104.1.2 Temporary structures. A special building permit for a limited time shall be obtained before the erection of temporary structures such as construction sheds, seats, canopies, tents and fences used in construction work or for temporary purposes such as reviewing stands. Such structures shall be completely removed upon the expiration of the time limit stated in the permit.

104.1.3 Work authorized. A building, electrical, gas, mechanical or plumbing permit shall carry with it the right to construct or install the work, provided the same are shown on the drawings and set forth in the specifications filed with the application for the permit. Where these are not shown on the drawings and covered by the specifications submitted with the application, separate permits shall be required.

104.1.4 Minor repairs. Application or notice to the building official is not required for ordinary repairs to structures, replacement of lamps or the connection of approved portable electrical equipment to approved permanently installed receptacles. Such repairs shall not include 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; nor shall ordinary repairs include 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.

104.1.5 Information required. Each application for a permit, with the required fee, shall be filed with the building official on a form furnished for that purpose and shall contain a general description of the proposed work and its location. The application shall be signed by the owner, or his authorized agent. The building permit application shall indicate the proposed occupancy of all parts of the building and of that portion of the site or lot, if any, not covered by the building or structure and shall contain such other information as may be required by the building official.

104.1.6 Time limitations. An application for a permit for any proposed work shall be deemed to have been abandoned 6 months after the date of filing for the permit, unless before then a permit has been issued. One or more extensions of time for periods of not more than 90 days each may be allowed by the building official for the application, provided the extension is requested in writing and justifiable cause is demonstrated.

104.2 Drawings and specifications
104.2.1 Requirements. When required by the building official, two or more copies of specifications, and of drawings drawn to scale with sufficient clarity and detail to indicate the nature and character of the work, shall accompany the application for a permit. Such drawings and specifications shall contain information, in the form of notes or otherwise, as to the quality of materials, where quality is essential to conformity with the technical codes. Such information shall be specific, and the technical codes shall not be cited as a whole or in part, nor shall the term "legal" or its equivalent be used as a substitute for specific information. All information, drawings, specifications and accompanying data shall bear the name and signature of the person responsible for the design.

104.2.2 Additional data. The building official may require details, computations, stress diagrams, and other data necessary to describe the construction or installation and the basis of calculations. All drawings, specifications and accompanying data required by the building official to be prepared by an architect or engineer shall be affixed with their official seal.

104.2.3 Design professional. The design professional shall be an architect or engineer legally registered under the laws regulating the practice of architecture or engineering and shall affix his official seal to said drawings, specifications and accompanying data, for the following:

1. All Group A, E and I occupancies.
2. Buildings and structures three stories or more high.
3. Buildings and structures 5,000 sq ft (465 m²) or more in area.

For all other buildings and structures, the submittal shall bear the certification of the applicant that some specific state law exception permits its preparation by a person not so registered.

**Exception:** Group R3 buildings, regardless of size, shall require neither a registered architect or engineer, nor a certification that an architect or engineer is not required.

### 104.2.4 Structural and fire resistance integrity

Plans for all buildings shall indicate how required structural and fire resistance integrity will be maintained where a penetration of a required fire resistant wall, floor or partition will be made for electrical, gas, mechanical, plumbing and communication conduits, pipes and systems. Such plans shall also indicate in sufficient detail how the fire integrity will be maintained where required fire resistant floors intersect the exterior walls and where joints occur in required fire resistant construction assemblies.

### 104.2.5 Site drawings

Drawings shall show the location of the proposed building or structure and of every existing building or structure on the site or lot. The building official may require a boundary line survey prepared by a qualified surveyor.

### 104.2.6 Hazardous occupancies

The building official may require the following:

1. General site plan. A general site plan drawn at a legible scale which shall include, but not be limited to, the location of all buildings, exterior storage facilities, permanent access ways, evacuation routes, parking lots, internal roads, chemical loading areas, equipment cleaning areas, storm and sanitary sewer access- ses, emergency equipment and adjacent property uses. The exterior storage areas shall be identified with the hazard classes and the maximum quantities per hazard class of hazardous materials stored.

2. Building floor plan. A building floor plan drawn to a legible scale which shall include, but not be limited to, all hazardous materials storage facilities within the building and shall indicate rooms, doorways, corri-dors, exits, fire rated assemblies with their hourly rating, location of liquidtight rooms, and evacuation routes. Each hazardous materials storage facility shall be identified on the plan with the hazard classes and quantity range per hazard class of the hazardous materials stored.

### 104.3 Examination of documents

**104.3.1 Plan review.** The building official shall examine or cause to be examined each application for a permit and the accompanying documents, consisting of drawings, specifications, computations and additional data, and shall ascertain by such examinations whether the construction indicated and described is in accordance with the requirements of the technical codes and all other pertinent laws or regulations.

**104.3.2 Affidavits.** The building official may accept a sworn affidavit from a registered architect or engineer stating that the plans submitted conform to the technical codes. For buildings and structures, the affidavit shall state that the plans conform to the laws as to egress, type of construction and general arrangement and, if accompanied by drawings, show the structural design and that the plans and design conform to the requirements of the technical codes as to strength, stresses, strains, loads and stability. The building official may without any examination or inspection accept such affidavit, provided the architect or engineer who made such affidavit agrees to submit to the building official copies of inspection reports as inspections are per formed and upon completion of the structure, electrical, gas, mechanical, or plumbing systems a certification that the structure, electrical, gas, mechanical, or plum bing system has been erected in accordance with the requirements of the technical codes. Where the building official relies upon such affidavit, the architect or engineer shall assume full responsibility for the compliance with all provisions of the technical codes and other pertinent laws or ordinances.

### 104.4 Issuing permits

**104.4.1 Action on permits.** The building official shall act upon an application for a permit without unreasonable or unnecessary delay. If the building official is satisfied that the work described in an application for a permit and the contract documents filed therewith conform to the requirements of the technical codes and other pertinent laws and ordinances, he shall issue a permit to the applicant.

**104.4.2 Refusal to issue permit.** If the application for a permit and the accompanying contract documents describing the work do not conform to the requirements of the technical codes or other pertinent laws or ordinances, the building official shall not issue a permit, but shall return the contract documents to the applicant with his refusal to issue such permit. Such refusal shall, when requested, be in writing and shall contain the reason for refusal.

**104.4.3 Special foundation permit.** When application for permit to erect or enlarge a building has been filed and pending issuance of such permit, the building official may at his discretion, issue a special permit for the foundation only. The holder of such a special permit is proceeding at his own risk and without assurance that a permit for the remainder of the work will be granted nor that corrections will not be required in order to meet provisions of the technical codes.

**104.4.4 Public right of way.** A permit shall not be given by the building official for the construction of any building, or for the alteration of any building where said building is to be changed and such change will affect the exterior walls, bays, balconies, or other appendages or projections fronting on any street, alley or public lane, or for the
placing on any lot or premises of any building or structure removed from another lot or premises, unless the applicant has made application at the office of the director of public works for the lines of the public street on which he proposes to build, erect or locate said building; and it shall be the duty of the building official to see that the street lines are not encroached upon except as provided for in Chapter 32.

104.5 Contractor's responsibilities. It shall be the duty of every contractor and person who makes a contract for the installation of, or repairs to, a building, electrical, gas, mechanical or plumbing system for which a permit is required to conform to the provisions of the law and Code relating to licensing.

104.6 Conditions of the permit

104.6.1 Permit intent. A permit issued shall be construed to be a license to proceed with the work and not as authority to violate, cancel, alter, or set aside any of the provisions of the technical codes, nor shall issuance of a permit prevent the building official from thereafter requiring a correction of errors in plans, construction, or violations of this code. Every permit issued shall become invalid unless the work authorized by such permit is commenced within one year after its issuance, or if the work authorized by such permit is suspended or abandoned for a period of six months after the time the work is commenced. One or more extensions of time, for periods not more than 90 days each, may be allowed for the permit. An extension of time, for a further period of six months, may be allowed for the permit in any case where the extension is necessary due to the occurrence of a national disaster. The extension shall be requested in writing and justifiable cause demonstrated. Extensions shall be in writing by the building official.

104.6.2 Permit issued on basis of an affidavit. Whenever a permit is issued in reliance upon an affidavit or whenever the work to be covered by a permit involves installation under conditions which, in the opinion of the building official, are hazardous or complex, the building official shall require that the architect or engineer who signed the affidavit or prepared the drawings or computations shall supervise such work. In addition, they shall be responsible for conformity with the permit, provide copies of inspection reports as inspections are performed, and upon completion make and file with the building official written affidavit that the work has been done in conformity with the reviewed plans and with the structural provisions of the technical codes. In the event such architect or engineer is not available, the owner shall employ in his stead a competent person or agency whose qualifications are reviewed by the building official.

104.6.3 Plans. When the building official issues a permit, he shall endorse, in writing or by stamp, both sets of plans "Reviewed for Code Compliance." One set of drawings so reviewed shall be retained by the building official and the other set shall be returned to the applicant. The permit drawings shall be kept at the site of work and shall be open to inspection by the building official or his authorized representative.

104.7 Fees

104.7.1 Prescribed fees.

104.7.2 Work commencing before permit issuance.

104.7.3 Accounting.

104.7.4 Schedule of Permit Fees.

104.7.5 Building permit valuations. If, in the opinion of the building official, the valuation of building, alteration, structure, electrical, gas, mechanical or plumbing systems appears to be underestimated on the application, permit shall be denied, unless the applicant can show detailed estimates to meet the approval of the building official. Permit valuations shall include total cost, such as electrical, gas, mechanical, plumbing equipment and other systems, including materials and labor.

SECTION 105
INSPECTIONS

105.1 Existing building inspections. Before issuing a permit, the building official may examine or cause to be examined any building, electrical, gas, mechanical, or plumbing systems for which an application has been received for a permit to enlarge, alter, repair, move, demolish, install, or change the occupancy. He shall inspect all buildings, structures, electrical, gas, mechanical and plumbing systems, from time to time, during and upon completion of the work for which a permit was issued. He shall make a record of every such examination and inspection and of all violations of the technical codes.

105.2 Manufacturers and fabricators. When deemed necessary by the building official, he shall make, or cause to be made, an inspection of materials or assemblies at the point of
manufacture or fabrication. A record shall be made of every such examination and inspection and of all violations of the technical codes.

105.3 Inspection service. The building official may make, or cause to be made, the inspections required by 105. He may accept reports of inspectors of recognized inspection services, provided that after investigation he is satisfied as to their qualifications and reliability. A certificate called for by any provision of the technical codes shall not be based on such reports unless the same are in writing and certified by a responsible officer of such service.

105.4 Inspections prior to issuance of Certificate of Occupancy or Completion. The building official shall inspect or cause to be inspected at various intervals all construction or work for which a permit is required, and a final inspection shall be made of every building, structure, electrical, gas, mechanical or plumbing system upon completion, prior to the issuance of the Certificate of Occupancy or Completion.

105.5 Posting of permit. Work requiring a permit shall not commence until the permit holder or his agent posts the permit card in a conspicuous place on the premises. The permit shall be protected from the weather and located in such position as to permit the building official or representative to conveniently make the required entries thereon. This permit card shall be maintained in such position by the permit holder until the Certificate of Occupancy or Completion is issued by the building official.

105.6 Required inspections. The building official upon notification from the permit holder or his agent shall make the following inspections and such other inspections as necessary, and shall either release that portion of the construction or shall notify the permit holder or his agent of any violations which must be corrected in order to comply with the technical codes:

**Building**

1. Foundation inspection: To be made after trenches are excavated and forms erected.
2. Frame inspection: To be made after the roof, all framing, fireblocking and bracing is in place, all concealing wiring, all pipes, chimneys, ducts and vents are complete.
3. Final inspection: To be made after the building is completed and ready for occupancy.

**Electrical**

1. Underground inspection: To be made after trenches or ditches are excavated, conduit or cable installed, and before any backfill is put in place.
2. Rough-In inspection: To be made after the roof, framing, fireblocking and bracing is in place and prior to the installation of wall or ceiling membranes.

3. Final inspection: To be made after the building is complete, all required electrical fixtures are in place and properly connected or protected, and the structure is ready for occupancy.

**Plumbing**

1. Underground inspection: To be made after trenches or ditches are excavated, piping installed, and before any backfill is put in place.
2. Rough-In inspection: To be made after the roof, framing, fireblocking and bracing is in place and all soil, waste and vent piping is complete, and prior to this installation of wall or ceiling membranes.
3. Final inspection: To be made after the building is complete, all plumbing fixtures are in place and properly connected, and the structure is ready for occupancy.

**Note:** See Section 312 of the Standard Plumbing Code for required tests.

**Mechanical**

1. Underground inspection: To be made after trenches or ditches are excavated, underground duct and fuel piping installed, and before any backfill is put in place.
2. Rough-In inspection: To be made after the roof, framing, fire blocking and bracing are in place and all ducting, and other concealed components are complete, and prior to the installation of wall or ceiling membranes.
3. Final inspection: To be made after the building is complete, the mechanical system is in place and properly connected, and the structure is ready for occupancy.

**Gas**

1. Rough piping inspection: To be made after all new piping authorized by the permit has been installed, and before any such piping has been covered or concealed or any fixtures or gas appliances have been connected.
2. Final piping inspection: To be made after all piping authorized by the permit has been installed and after all portions which are to be concealed by plastering or otherwise have been so concealed, and before any fixtures or gas appliances have been connected. This inspection shall include a pressure test.
3. Final inspection: To be made on all new gas work authorized by the permit and such portions of existing systems as may be affected by new work or any changes, to insure compliance with all the requirements of this code and to assure that the installation and construction of the gas system is in accordance with reviewed plans.

105.7 Written release. Work shall not be done on any part of a building, structure, electrical, gas, mechanical or
105.8 Reinforcing steel and structural frames. Reinforcing steel or structural frame work of any part of any building or structure shall not be covered or concealed from view without first obtaining a release from the building official.

105.9 Plaster fire protection. In all buildings where plaster is used for fire protection purposes, the permit holder or his agent shall notify the building official after all lathing and backing is in place. Plaster shall not be applied until the release from the building official has been received.

105.10 Fire resistant joints and penetrations. The protection of joints and penetrations in required fire resistant construction assemblies shall not be covered or concealed from view without first obtaining a release from the building official.

SECTION 106 CERTIFICATES

106.1 Certificate of Occupancy

106.1.1 Building occupancy. A new building shall not be occupied or a change made in the occupancy, nature or use of a building or part of a building until after the building official has issued a certificate of occupancy. Said certificate shall not be issued until all required electrical, gas, mechanical, plumbing and fire protection systems have been inspected for compliance with the technical codes and other applicable laws and regulations and released by the building official.

106.1.2 Issuing Certificate of Occupancy. Upon satisfactory completion of construction of a building or structure and installation of electrical, gas, mechanical and plumbing systems in accordance with the technical codes, reviewed plans and specifications, and after the final inspection, the building official shall issue a certificate of occupancy stating the nature of the occupancy permitted, the number of persons for each floor when limited by law, and the allowable load per square foot for each floor in accordance with the provisions of this code.

106.1.3 Special Permission to occupy. A special permission to occupy certificate of occupancy may be issued for a portion or portions of a building which may safely be occupied prior to final completion of the building.

106.2 Certificate of Completion. Upon satisfactory completion of a building, structure, electrical, gas, mechanical or plumbing system, a certificate of completion may be issued. This certificate is proof that a structure or system is complete and for certain types of permits is released for use and may be connected to a utility system. This certificate does not grant authority to occupy or connect a building, such as a shell building, prior to the issuance of a certificate of occupancy.

106.3 Service utilities

106.3.1 Connection of service utilities. No person shall make connections from a utility, source of energy, fuel or power to any building or system which is regulated by the technical codes for which a permit is required, until released by the building official and a certificate of occupancy or completion is issued.

106.3.2 Temporary connection. The building official may authorize the temporary connection of the building or system to the utility source of energy, fuel or power for the purpose of testing building service systems or for use under a temporary certificate of occupancy.

106.3.3 Authority to disconnect service utilities. The building official shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by the technical codes, in case of emergency where necessary to eliminate an immediate hazard to life or property. The building official shall notify the serving utility, and whenever possible the owner and occupant of the building, 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, structure or service system shall be notified in writing, as soon as practical thereafter.

106.4 Posting floor loads

106.4.1 Occupancy. An existing or new building shall not be occupied for any purpose which will cause the floors thereof to be loaded beyond their safe capacity. The building official may permit occupancy of a building for mercantile, commercial or industrial purposes, by a specific business, when he is satisfied that such capacity will not thereby be exceeded.

106.4.2 Storage and Factory-Industrial Occupancies. It shall be the responsibility of the owner, agent, proprietor or occupant of Group S and Group F occupancies, or any occupancy where excessive floor loading is likely to occur, to employ a competent architect or engineer in computing the safe load capacity. All such computations shall be accompanied by an affidavit from the architect or engineer stating the safe allowable floor load on each floor in lbs per sq ft uniformly distributed. The computations and affidavit shall be filed as a permanent record of the building department.

106.4.3 Signs required. In every building or part of a building used for storage, industrial or hazardous purposes, the safe floor loads, as reviewed by the building official on the plan, shall be marked on plates of approved design which shall be supplied and securely affixed by the owner of the building in a conspicuous place in each story to which they relate. Such plates shall not be removed or defaced, and if lost, removed or defaced, shall be replaced by the owner of the building.
SECTION 107
TESTS

The building official may require tests or test reports as proof of compliance. Required tests are to be made at the expense of the owner, or his agent, by an approved testing laboratory or other approved agency.

SECTION 108
CONSTRUCTION BOARD OF ADJUSTMENT AND APPEALS

108.1 Appointment. There is hereby established a board to be called the Construction Board of Adjustment and Appeals, which shall consist of seven members and two alternates. The Board shall be appointed by the applicable governing body.

108.2 Membership and terms

108.2.1 Membership. The Construction Board of Adjustment and Appeals shall consist of seven members. Such board members shall be composed of individuals with knowledge and experience in the technical codes, such as design professionals, contractors or building industry representatives. In addition to the regular members, there should be two alternate members, one member at large from the building industry and one member at large from the public. A board member shall not act in a case in which he has a personal or financial interest.

108.2.2 Terms. The terms of office of the board members shall be staggered so no more than 1/3 of the board is appointed or replaced in any 12 month period. The two alternates, if appointed, shall serve one year terms. Vacancies shall be filled for an unexpired term in the manner in which original appointments are required to be made. Continued absence of any member from required meetings of the board shall, at the discretion of the applicable governing body, render any such member subject to immediate removal from office.

108.2.3 Quorum and voting. A simple majority of the board shall constitute a quorum. In varying any provision of this code, the affirmative votes of the majority present, but not less than three affirmative votes, shall be required. In modifying a decision of the building official, not less than four affirmative votes, but not less than a majority of the board, shall be required. In the event that regular members are unable to attend a meeting, the alternate members, if appointed, shall vote.

108.2.4 Secretary of board. The building official shall act as secretary of the board and shall make a detailed record of all of its proceedings, which shall set forth the reasons for its decision, the vote of each member, the absence of a member and any failure of a member to vote.

108.3 Powers. The Construction Board of Adjustments and Appeals shall have the power, as further defined in 108.4, to hear appeals of decisions and interpretations of the building official and consider variances of the technical codes.

108.4 Appeals

108.4.1 Decision of the building official. The owner of a building, structure or service system, or his duly authorized agent, may appeal a decision of the building official to the Construction Board of Adjustment and Appeals whenever any one of the following conditions are claimed to exist:
1. The building official rejected or refused to approve the mode or manner of construction proposed to be followed or materials to be used in the installation or alteration of a building, structure or service system.
2. The provisions of this code do not apply to this specific case.
3. That an equally good or more desirable form of installation can be employed in any specific case.
4. The true intent and meaning of this code or any of the regulations thereunder have been misconstrued or incorrectly interpreted.

108.4.2 Variances. The Construction Board of Adjustments and Appeals, when so appealed to and after a hearing, may vary the application of any provision of this code to any particular case when, in its opinion, the enforcement thereof would do manifest injustice and would be contrary to the spirit and purpose of this or the technical codes or public interest, and also finds all of the following:
1. That special conditions and circumstances exist which are peculiar to the building, structure or service system involved and which are not applicable to others.
2. That the special conditions and circumstances do not result from the action or inaction of the applicant.
3. That granting the variance requested will not confer on the applicant any special privilege that is denied by this code to other buildings, structures or service system.
4. That the variance granted is the minimum variance that will make possible the reasonable use of the building, structure or service system.
5. That the grant of the variance will be in harmony with the general intent and purpose of this code and will not be detrimental to the public health, safety and general welfare.

108.4.2.1 Conditions of the variance. In granting the variance, the board may prescribe a reasonable time limit within which the action for which the variance is required shall be commenced or completed or both. In addition, the board may prescribe appropriate conditions and safeguards in conformity with this code. Violation of the conditions of a variance shall be deemed a violation of this code.

108.4.3 Notice of appeal. Notice of appeal shall be in writing and filed within 30 calendar days after the decision is rendered by the building official. Appeals shall be in a form acceptable to the building official.

108.4.4 Unsafe or dangerous buildings or service systems. In the case of a building, structure or service system which, in the opinion of the building official, is
unsafe, unsanitary or dangerous, the building official may, in his order, limit the time for such appeals to a shorter period.

108.5 Procedures of the Board

108.5.1 Rules and regulations. The board shall establish rules and regulations for its own procedure not inconsistent with the provisions of this code. The board shall meet on call of the chairman. The board shall meet within 30 calendar days after notice of appeal has been received.

108.5.2 Decisions. The Construction Board of Adjustment and Appeals shall, in every case, reach a decision without unreasonable or unnecessary delay. Each decision of the board shall also include the reasons for the decision. If a decision of the board reverses or modifies a refusal, order, or disallowance of the building official or varies the application of any provision of this code, the building official shall immediately take action in accordance with such decision. Every decision shall be promptly filed in writing in the office of the building official and shall be open to public inspection. A certified copy of the decision shall be sent by mail or otherwise to the appellant and a copy shall be kept publicly posted in the office of the building official for two weeks after filing. Every decision of the board shall be final, subject however to such remedy as any aggrieved party might have at law or in equity.

SECTION 109
SEVERABILITY

If any section, subsection, sentence, clause or phrase of this code is for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this code.

SECTION 110
VIOLATIONS AND PENALTIES
CHAPTER 2
DEFINITIONS

SECTION 201
GENERAL

201.1 Scope. For the purpose of this code, certain abbreviations, terms, phrases, words, and their derivatives, shall be construed as set forth in this chapter.

201.2 Tense, gender and number. Words used in the present tense include the future. Words in the masculine gender include the feminine and neuter. The singular number includes the plural and the plural number includes the singular.

201.3 Words not defined. Words not defined herein shall have the meanings stated in the Standard Mechanical Code, Standard Plumbing Code, Standard Gas Code or Standard Fire Prevention Code. Words not defined in the Standard Codes shall have the meanings in Webster's Ninth New Collegiate Dictionary, as revised.

SECTION 202
DEFINITIONS

ACCELERATION
Effective Peak. Coefficient Aa, according to 1607.1.5 for determining the prescribed seismic forces.
Effective Peak Velocity-Related. Coefficient Av, for determining the prescribed seismic forces given in 1607.1.5.

ACCESSIBLE. Having access to but which first may require the removal of a panel, door or similar covering of the item described. See "Readily Accessible."

ACCESSIBLE. A site, building, facility, or portion thereof that complies with Chapter 11 and that can be approached, entered, and used by persons with a physical disability.

ACCESSIBLE MEANS OF EGRESS. A path of travel, usable by a mobility impaired person, that leads to a public way.

ACCESSIBLE ROUTE. A continuous unobstructed path connecting all accessible elements and spaces in a building or facility, that can be negotiated by a person with a severe disability using a wheelchair, and that is also safe for and usable by people with other disabilities.

ACCREDITATION BODY. An approved, third-party organization which 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.

ADAPTABILITY. The capability of certain building spaces and elements, such as kitchen counters, sinks, and grab bars, to be altered or added so as to accommodate the needs of persons with and without disabilities, or to accommodate the needs of persons with different types or degrees of disability.

ADDITION. An extension or increase in floor area or height of a building or structure.

AEROSOL. A product dispensed from an aerosol container by propellant and classified as follows:
Level 1 Aerosol Products. Aerosol products with a total chemical heat of combustion that is less than or equal to 8,600 Btu/lb (20 kJ/g).
Level 2 Aerosol Products. Aerosol products 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. Aerosol products with a total chemical heat of combustion that is greater than 13,000 Btu/lb (30 kJ/g).

AEROSOL CONTAINER. Metal cans, glass or plastic bottles designed to disperse an aerosol. Metal cans shall be limited to maximum size of 33.8 fl oz (1.0 L). Glass or plastic bottles shall be limited to a maximum size of 4 fl oz, (0.128 L).

AIR INFLATED STRUCTURE. A building or portion thereof whose shape is maintained by air pressurization of unoccupied cells or tubes. A system of cables, bands, webbing, ropes or similar tensile elements may be used to restrain the membrane and transfer the tensile forces to supports.

AIR SUPPORTED STRUCTURE. A structure consisting of a membrane which achieves and maintains its shape and support by air pressure within the occupied space.

AISLE ACCESSWAY. That portion of an exit access that leads to an aisle.

ALARM INDICATING APPLIANCE. An electromechanical appliance that converts energy into audible or visible form for perception as an alarm signal.

ALLEY. Any public space or thoroughfare 20 ft (6096 mm) or less wide which has been dedicated or deeded for public use.

ALTER OR ALTERATION. Any change or modification in construction or occupancy.

ALTERATION. A change to a building or facility that affects its usability by a person with disabilities.
ALTERNATING TREAD STAIRWAY. A stairway having a series of steps between 50° (0.87 rad) and 70° (1.22 rad) from horizontal, usually attached to a center support rail in an alternating manner so that the user never has both feet at the same level at the same time. The initial tread of the stairway begins at the same elevation as the platform, landing or floor surface.

AMUSEMENT BUILDING, SPECIAL. Any building or portion thereof, temporary, permanent or mobile used for amusement, entertainment, or educational purposes and which contains a device or system which conveys passengers or provides a walkway along, around, or over a course in any direction so arranged that the egress path is not readily apparent due to visual or audio distractions or is intentionally confused or is not readily available due to the nature of the attraction or mode of conveyance through the building or structure.

ANCHOR. Metal rod, wire or strap that secures masonry to its structural support.

ANCHOR STORE. An exterior perimeter department store or major merchandising center having direct access to a mail but having all required exits independent of a mall.

AND/OR. In a choice of two code provisions, signifies that use of both provisions will satisfy the code requirement and use of either provision is acceptable also.

ANNULAR SPACE. The opening around the penetrating item.

APARTMENT. See "Dwelling Unit."

APARTMENT HOUSE. Any building or portion thereof used as a multiple dwelling for the purpose of providing three or more separate dwelling units which may share means of egress and other essential facilities.

APPLICABLE GOVERNING BODY. A city, county, state, state agency or other political government subdivision or entity authorized to administer and enforce the provisions of this code, as adopted or amended.

APPROVED. Approved by the building official or other authority having jurisdiction.

ARCHITECT. A duly registered and licensed architect.

ARCHITECTURAL TRIM. The ornamental or protective framing or edging around openings or at corners or eaves and other architectural elements attached to the exterior walls of buildings, usually of a color and material different from that of the adjacent wall surface, and serving no structural purpose.

AREA, BUILDING. The area included within surrounding exterior walls, or exterior walls and firewalls, exclusive of courts. The area of a building or portion of a building with-out surrounding walls shall be the usable area under the horizontal projection of the roof or floor above.

AREA, GROSS CROSS-SECTIONAL. The areas delineated by the out-to-out dimensions of masonry in the plane under consideration.

AREA, GROSS FLOOR. The area within the inside perimeter of the exterior walls with no deduction for corridors, stairs, closets, thickness of walls, columns or other features, exclusive of areas open and unobstructed to the sky.

AREA, NET FLOOR. The area actually occupied not including accessory unoccupied areas such as corridors, stairs, closets, thickness of walls, columns, toilet room, mechanical area or other features.

AREA OF REFUGE. An area with direct access to an exit where persons unable to use stairs can remain temporarily in safety to await instructions or assistance during emergency evacuation.

ASSEMBLY OCCUPANCY. Defined in 304.

ATRIUM. A space, intended for occupancy within a building, extending vertically through the building and enclosed at the top.

AUTOMATIC. As applied to fire protection devices, is 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 rise of temperature, or combustion products, such as incorporated in an automatic sprinkler system, automatic fire door, automatic fire shutter, or automatic fire vent.

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.

AUTOMOTIVE SERVICE STATION. Defined in 404.2.

AWNING. An architectural projection that provides weather protection, identity and/or decoration and is wholly supported by the building to which it is attached. An awning is comprised of a lightweight, rigid or retractable skeleton structure over which an approved cover is attached.

BALCONY, ASSEMBLY ROOM. That portion of the seating space of an assembly room, the lowest part of which is raised 4 ft (1219 mm) or more above the level of the main floor.

BASE. The level at which the horizontal seismic ground motions are considered to be imparted to the building.

BASE SHEAR. Total design lateral force or shear at the base of the building.
BASEMENT. Any building story having a floor below grade.

BEARING WALL SYSTEM. A structural system with bearing walls providing support for all, or major portions of, the vertical loads. Shear walls or braced frames provide seismic force resistance.

BED JOINT. The horizontal layer of mortar on which a masonry unit is laid.

BLOCKED DIAPHRAGM. A diaphragm in which all sheathing edges not occurring on a framing member are supported on and connected to blocking.

BLEACHERS. Tiered or stepped seating facilities without backrests.

BOILER. A heating appliance intended to supply hot water or steam.

BUILDING. Any structure that encloses a space used for sheltering any occupancy. Each portion of a building separated from other portions by a fire wall shall be considered as a separate building.

BUILDING, EXISTING. Any structure erected prior to the adoption of this code, or one for which a legal building permit has been issued.

BUILDING LINE. The line, established by law, beyond which the building shall not extend, except as specifically provided by law.

BUILDING OFFICIAL. The officer or other designated authority, or their duly authorized representative, charged with the administration and enforcement of this code.

BUILDING, SIMPLE DIAPHRAGM. A building which complies with all of the following conditions:
1. enclosed building
2. mean roof height $h$ less than or equal to 60 ft (18 m), and
3. mean roof height $h$ does not exceed least horizontal dimension, and
4. building has a symmetrical cross section, and
5. building has no expansion joints or structural separations within the building, and
6. wind loads are transmitted through floor and roof diaphragms to the vertical lateral force resisting systems, and
7. if the building has moment resisting frames, roof slopes do not exceed 30°.

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.

BUSINESS OCCUPANCY. Defined in 305.

CARBONATE AGGREGATE CONCRETE. Concrete made with aggregates consisting mainly of calcium or magnesium carbonate, e.g., limestone or dolomite.

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 before the contaminant becomes a health hazard. The ceiling limits utilized are to be those published in OSHA 29 CFR 19 10. 1000.

CELLULAR CONCRETE. 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).

CERAMIC FIBER BLANKET. A mineral wool insulation material made of alumina-silica fibers and weighing 4 to 10 pcf (64 to 160 kg/m³).

CHIMNEY CONNECTOR. The pipe which connects a fuel-burning appliance to a chimney.

CITY. See "Applicable Governing Body."

COLLAR JOINT. Vertical longitudinal joint between wythes of masonry or between masonry and backup construction which is permitted to be filled with mortar or grout.

COMBUSTIBLE FIBERS. Any readily ignitable and free burning fibers, such as cotton, sisal, henequen, ixtle, jute, hemp, tow, cocoa fibers, oakum, rags, waste, cloth, wastepaper, kapok, hay, straw, Spanish moss, excelsior, and other like materials.

COMBUSTIBLE MATERIAL. A material which cannot be classified as noncombustible in accordance with that definition.

COMMON PATH OF TRAVEL. That portion of exit access that must be traversed before two separate and distinct paths of travel to two exits are available. Paths that merge are common paths of travel. Common path of travel is measured in the same manner as travel distance but terminates at that point where two separate and distinct routes become available.

COMPONENTS AND CLADDING. Elements that are either directly loaded by the wind or receive wind loads originating at relatively close locations and that transfer these loads to the main wind force resisting system.

CONNECTOR. A mechanical device for securing two or more pieces, parts, or members together; including anchors, wall ties, and fasteners.
CONSTRUCTION TYPES.
Type I - See 603  Type IV -See 606
Type II - See 604  Type V - See 607
Type III - See 605  Type VI -See 608

CONTINUOUS GAS DETECTION SYSTEM. A gas detection system where the analytical instrument is maintained in continuous operation and sampling is performed without interruption or at intervals not to exceed 30 minutes.

CONTROL AREA. Space within a building where the exempt amounts of hazardous materials may be stored, dispensed, used or handled.

CORRIDOR. A passageway into which compartments or rooms open and which is enclosed by partitions, other than partial partitions, and/or walls and a ceiling or a floor/roof deck above.

CORROSION RESISTANT. Any nonferrous metal or any metal having an unbroken surfacing of nonferrous metal, or steel with not less than 10 percent chromium or with not less than 0.20 percent copper.

CORROSIVE. A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact. A chemical is considered to be corrosive if, when tested on the intact skin of albino rabbits by the method described by the U.S. Department of Transportation in Appendix A to CFR 49 Part 173, it destroys or changes irreversibly the structure of the tissue at the site of contact following an exposure period of four hours. This term shall not refer to action on inanimate surfaces.

COVERED MALL BUILDING. A single building three stories or less in height enclosing a number of tenants and occupancies such as anchor stores, retail, 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 malls.

CRANE LOAD. The dead, live and impact loads and forces resulting from the operation of permanent cranes.

CURB LEVEL. Referring to a building means the elevation at that point of the street grade that is opposite the center of the wall nearest to and facing the street line.

CYLINDER. A pressure vessel designed for pressures higher than 40 psi (276 kPa) and having a circular cross section. It does not include a portable tank, multi-unit tank car tank, cargo tank or tank car.

DALLE GLASS. A decorative composite glazing material made of individual pieces of glass, which are embedded in a cast matrix of concrete or epoxy.

DEAD END. A hallway, corridor or space open to a corridor so arranged that it can be entered from an exit access corridor without passage through a door, but does not lead to an exit.

DEAD LOAD. The weight of all permanent construction, including walls, floors, roofs, ceilings, stairways, and fixed service equipment, plus the net effect of prestressing.

DECORATIVE GLASS. A carved, leaded or Dalle glass or glazing material whose purpose is decorative or artistic, not a 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.

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.

DESIGN EARTHQUAKE. The earthquake at the site under consideration that produces ground motions having a 90% probability of not being exceeded in 50 years.

DESIGNATED SEISMIC SYSTEMS. The Seismic Resisting System and those architectural, electrical, and mechanical systems and their components that require special performance characteristics.

DETACHED STORAGE. Storage in a separate building or in an outside area located away from all structures.

DETONATION. An exothermic reaction characterized by the presence of a shock wave in the material, which established 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.

DIAPHRAGM. A horizontal or nearly horizontal system designed to transmit lateral forces to shearwalls or other vertical resisting elements.

DIAPHRAGM. A horizontal, or nearly horizontal, portion of the Seismic Resisting System, which is designed to transmit seismic forces to the vertical elements of the Seismic Resisting System.

DIMENSIONS, NOMINAL. Equal to the actual dimension plus the width of the mortar joint. Dimensions and thickness specified in this chapter are nominal dimensions.

DISPENSING. The pouring or transferring of any material from a container, tank or similar vessel whereby vapors, dusts, fumes, mists or gases may be liberated to the atmosphere.

DISPLAY SIGN. A structure that is arranged, intended, designed or used as an advertisement, announcement or direction, and includes a sign, sign screen, billboard, and advertising devices of every kind.

DOOR, BALANCED. A door equipped with double-pivoted hardware so designed as to cause a semi counterbalanced swing action when opening.
DORMITORY. A space in a unit where group sleeping accommodations are provided with or without meals for persons not members of the same family group, in one room or in a series of closely associated rooms under joint occupancy and single management, as in college dormitories, fraternity houses, military barracks, and ski lodges.

DRY CLEANING. The process of removing dirt, grease, paints and other stains from wearing apparel, textiles, fabrics, rugs, or other materials by the use of non-aqueous liquids (solvents). It shall include the process of dyeing clothes or other fabrics or textiles in a solution of dye colors and non-aqueous liquid solvents.

DRY CLEANING SYSTEMS. Dry cleaning plants or systems are classified as follows:

Type I - those systems using Class I flammable liquid solvents having a flash point below 100°F (38°C).
Type II - those systems using Class II combustible liquid solvents having a flash point at or above 100°F (38°C) and below 140°F (60°C).
Type III - those systems using Class III combustible liquid solvents having a flash point at or above 140°F (60°C).
Type IV and Type V - those systems using Class IV non-flammable liquid solvents.

DUST. Pulverized particles, which, if mixed with air in the proper proportions, become explosive and may be ignited by a flame, spark, or other source of ignition.

DUPLEX. Two dwelling units one above the other or side-by-side having a common wall and being on one lot.

DWELLING. A building occupied exclusively for residential purposes by not more than two families, unless qualified otherwise in code text.

DWELLING UNIT. Bears the meaning ascribed to that term in regulation 2 of the Development and Planning Regulation (2006 Revision).

DWELLING UNIT, TYPE A. A dwelling unit designed and constructed for accessibility in accordance with Section 1002 of CABO/ANSI A1 17.1.

DWELLING UNIT, TYPE B. A dwelling unit designed and constructed for accessibility in accordance with Section 1003 of CABO/ANSI A117.1, and intended to be consistent with technical requirements for fair housing required by federal law.

EDUCATIONAL OCCUPANCY. Defined in 306.

EFFECTIVE HEIGHT. Clear height of a braced member between lateral supports and used for calculating the slenderness ratio of a member. Effective height for unbraced members shall be calculated.

EFFECTIVE WIND AREA FOR COMPONENTS AND CLADDING. The tributary area used to determine pressure coefficients of the element considered, but need not be less than one-third the square of the span.

ELECTRICAL INSPECTORATE. The electrical inspectorate established under section 5 of the Electricity Law (2005 Revision).

EMERGENCY ESCAPE AND RESCUE OPENING. An operable window, door or other similar device that in the event of an emergency provides for a means of escape and access for rescue.

EMERGENCY RESPONSE RECOVERY KIT. A chlorine emergency kit designed to contain leaks in chlorine containers. A kit operates by containing valve leaks with hoods and gaskets or providing sealing devices for small holes in side walls. The kit shall be capable of containing all remaining chlorine in the cylinder.

ENCLOSED BUILDING. A building that encloses a space and does not have openings that qualify it as a partially enclosed or open building.

EVALUATION REPORT. A report indicating compliance with the provisions of the Standard Building Code as analyzed by the Evaluation Committee of SBCCI PST & ESI.

EXCESS FLOW CONTROL. A fail-safe system designed to shut off flow due to a rupture in pressurized piping systems.

EXHAUSTED ENCLOSURE. Power-ventilated equipment of varying dimensions and construction provided to enclose or accommodate a gas or vapor use or filling operation and to confine and limit the escape of gas or vapors and to exhaust them safely. The exhausted enclosure is not required to be totally enclosed.

EXIT. That portion of the means of egress which is separated from all other spaces of a building or structure by construction and opening protectives, as required for exits, to provide a protected way of travel to the exit discharge. Exits include exterior exit doors, separated exit stairs, exit passageways and horizontal exits.

EXIT ACCESS. That portion of a means of egress which leads to an entrance to an exit.

EXIT COURT. An outside space with building walls on three or more sides and open to the sky.

EXPANDED VINYL WALL COVERING. Wall covering consisting of a woven textile backing, an expanded vinyl base coat layer, and a non-expanded vinyl skin coat. The expanded base coat layer is a homogeneous vinyl layer which contains a blowing agent. During processing, the blowing agent decomposes which causes this layer to expand by forming closed cells. The total thickness of the wall covering is approximately 0.055 to 0.070 inch (1.4 to 1.8 mm)
EXPLOSION. An effect produced by the sudden violent expansion of gases, which may be accompanied by a shockwave or disruption, or both, of enclosing materials or structures. An explosion may result from:
   1. chemical changes such as rapid oxidation, deflagration or detonation, decomposition of molecules and runaway polymerization (usually detonations);
   2. physical changes (e.g., pressure tank ruptures); or
   3. atomic changes (nuclear fission or fusion).

F RATING. The time period that the penetration firestop system limits the spread of fire through the penetration when tested in accordance with ASTM E 814.

FACILITY. All or any portion of a building, structure, or area, including the site on which such building, structure, or area is located, wherein specific services are provided or activities are performed.

FAMILY. One or more persons living together, whether related to each other by birth or not, and having common housekeeping facilities.

FARM BUILDINGS. Structures, other than residences and structures appurtenant thereto, for on-farm use (barns, sheds, poultry houses, etc.).

FIRE ALARM BOX, MANUAL. A manually operated, alarm initiating device that activates a fire alarm system.

FIRE ALARM SYSTEM. Electrically operated circuits, instruments, and devices, together with the necessary electrical energy, designed to transmit alarms, supervisory, and trouble signals necessary for the protection of life and property.

FIRE BRIGADE CONNECTIONS. A hose connection at grade or street level for use by the Fire Brigade only for the purposes of supplying water to standpipes or sprinkler systems.

FIRE COMMAND STATION. The principal location where the status of the detection, alarm, communications and control systems is displayed and from which the system has the capability for manual control.

FIRE DAMPER. A listed device that meets the requirements of UL 555 and is designed to close automatically upon detection of heat.

FIRE DEPARTMENT. The Fire Brigade established under the Fire Brigade Law, 1999 (Revision).

FIRE DETECTION SYSTEM, AUTOMATIC. A fire alarm system containing automatic detecting devices that activate a fire alarm signal.

FIRE DOOR. A door and its assembly so constructed and assembled in place as to give the specified protection against the passage of fire.

FIRE OFFICIAL. The person appointed under the Fire Brigade Law, 1999 (Revision).

FIRE PREVENTION DEPARTMENT. The Fire Brigade established under the Fire Brigade Law, 1999 (Revision).

FIRE RESISTANCE or FIRE RESISTANCE RATING. The period of time a building or building component maintains the ability to confine a fire or continues to perform a given structural function or both, as determined by tests prescribed in 701.2.

FIRE RESISTANT JOINT SYSTEM. An assemblage of specific materials or products that are designed, tested and fire resistance rated in accordance with ASTM E 119 to resist, for a prescribed period of time, the passage of fire through joints.

FIRE RETARDANT TREATED WOOD. Any wood product which, when impregnated with chemicals by pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E 84, a flamespread index of 25 or less and show no evidence of significant progressive combustion when the test is continued for an additional 20 minute period. In addition, the flame front shall not progress more than 10 1/2 ft (3200 mm) beyond the center line of the burners at any time during the test. See 2301.8 for acceptance criteria for fire retardant treated wood.

FIRE WALL. A 4-hour fire resistant wall, having protective 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.

FIREBLOCKING. Barriers installed to resist the movement of flame and gases to other areas of a building through small concealed passages in building components such as floors, walls and stairs.

FLAMESPREAD. The propagation of flame over a surface.

FLAMESPREAD RATING. That numerical value assigned to a material tested in accordance with ASTM E 84.

FLAMMABLE SOLID. A solid substance, other than one which is defined as a blasting agent or explosive, that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or as a result of retained heat from manufacture, or which has an ignition temperature below 212°F (100°C), or which burns so vigorously or persistently when ignited so as to create a serious hazard.

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 rated floor.

FLYGALLERY. A raised floor area above a stage from which the movement of scenery and operation of other stage effects are controlled.
FOOTBOARDS. That part of a raised seating facility other than an aisle or cross aisle upon which the occupant walks to reach a seat. Applies to reviewing stands, grandstands and bleachers.

FRAME

Braced. An essentially vertical truss, or its equivalent, of the concentric or eccentric type that is provided in a bearing wall, building frame or dual system to resist seismic forces.

Concentrically Braced Frame. A braced frame in which the members are subjected primarily to axial forces.

Eccentrically Braced Frame (EBF). A diagonally braced steel frame in which at least one end of each brace frames into a beam a short distance from a beam-column joint or from another diagonal brace. These short beam segments are called link beams. The following EBF definitions apply:

Diagonal Brace. A member of an EBF placed diagonally in the bay of the frame.

Lateral Support Members. Secondary members designed to prevent lateral or torsional buckling of beams in an EBF.

Link Beam. The horizontal beam in an EBF which has a length of the clear distance between the diagonal braces or between the diagonal brace and the column face.

Link Beam End Web Stiffeners. Vertical web stiffeners placed on the sides of the web at the diagonal brace ends of the link beam.

Link Beam Intermediate Web Stiffener. Vertical web stiffeners placed within the link beam.

Link Beam Rotation Angle. The angle between the beam outside of the link beam and the link beam occurring at a total story drift of the deflection amplification factor, $C_d$, times the elastic drift at the prescribed design forces. The rotation angle is permitted to be computed assuming the EBF bay is deformed as a rigid, ideally plastic mechanism.

Intermediate Moment Frame. A frame in which members and joints are capable of resisting forces by flexure as well as along the axis of the members. Intermediate moment frames of reinforced concrete shall conform to 1912.1.2.

Ordinary Moment Frame. A frame in which members and joints are capable of resisting forces by flexure as well as along the axis of the members.

Special Moment Frame. A frame in which members and joints are capable of resisting forces by flexure as well as along the axis of the members. Special moment frames shall conform to the applicable requirements of 1912 or 2212.

Space Frame. A structural system composed of interconnected members, other than bearing walls, that is capable of supporting vertical loads and, if so designed, resisting the seismic forces.

FRAME SYSTEM

Building. A structural system with an essentially complete space frame providing support for vertical loads. Seismic force resistance is provided by shear walls or braced frames.

Dual. A structural system with an essentially complete space frame providing support for vertical loads. A moment resisting frame shall be provided that shall be capable of resisting at least 25% of the prescribed seismic forces. The total seismic force resistance is provided by the combination of the moment resisting frame together with shear walls or braced frames in proportion to their relative rigidities.

Moment Resisting. A structural system with an essentially complete space frame providing support for vertical loads. Seismic force resistance is provided by special, intermediate, or ordinary moment frames capable of resisting the total prescribed forces.

GALLERY. That portion of the seating space of an assembly room having a seating capacity of more than ten located above a balcony.

GLASS FIBER BOARD. 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 draft reinforced with a glass fiber.

GRADE. A reference plane representing the average of finished ground level adjoining the building at all exterior walls. When 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 between the building and a point 6 ft (1829 mm) from the building, whichever is closer to the building.

GRADE, LUMBER. The division of sawn lumber into quality classes with respect to its physical and mechanical properties as defined in published lumber manufacturer's standard grading rules.

GRANDSTANDS. Tiered or stepped seating facilities.

GRIDIRON. The structural framing over a stage supporting equipment for hanging or flying scenery and other stage effects.

GROSS LEASABLE AREA. The total floor area designed for tenant occupancy and exclusive use. The area of tenant occupancy is measured from the center lines 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.

GROUND FLOOR DWELLING UNIT. A dwelling unit with a primary entrance and habitable space at grade.
GROUND SIGN. An outdoor advertising display sign supported by uprights or braces in or upon the ground, or mounted on a vehicle, trailer, or mobile structure principally used for the purpose of advertising.

GROUT. Mixture of cementitious materials and aggregate to which sufficient water is added to produce pouring consistency without segregation of the constituents.

GUARDRAIL SYSTEM. A system of building components located near the open sides of elevated walking surfaces.

GUEST HOUSE (Transient). Any building or portion thereof containing not more than six guest rooms, where rent is paid and guests are transient.

GUEST HOUSE (Not Transient). Any building or portion thereof containing guest rooms where rent is paid and guests are not transient.

GYPSUM BACKING BOARD. A gypsum board used for interior applications as a backing in multi layer systems for gypsum wallboard, acoustical tile or other dry cladding, manufactured in accordance with ASTM C 442.

GYPSUM SHEATHING. A gypsum board used as a backing for exterior surface materials, manufactured with water-repellent paper and which may be manufactured with a water-resistant core, in accordance with ASTM C 79.

GYPSUM WALLBOARD. A gypsum board manufactured in accordance with ASTM C 36 used primarily as an interior surfacing for building structures.

GYPSUM WALLBOARD, TYPE X. A gypsum board specially manufactured to provide specific fire-resistant characteristics.

HABITABLE SPACE. A space in a structure for living, sleeping, eating or cooking. Bathrooms, toilet compartments, closets, halls, storage or utility space, and similar areas are not considered habitable space.

HANDRAIL. A horizontal or sloping rail grasped by hand for guidance or support.

HAZARD CONTENTS, HIGH. Contents which are liable to burn with extreme rapidity or from which poisonous fumes or explosions are to be feared in case of fire.

HAZARD CONTENTS, LOW. Contents of such low combustibility that no self-propagating fire therein can occur. The only probable danger requiring the use of emergency exits will be from panic, fumes, smoke, or fire from some external source.

HAZARD CONTENTS, ORDINARY. Contents which are liable to burn with moderate rapidity or to generate a considerable volume of smoke but from which neither poisonous fumes nor explosions are to be feared in case of fire.

HAZARDOUS MATERIALS. Those chemicals or substances which are physical hazards or health hazards as defined and classified in 407 whether the materials are in usable or waste condition.

HAZARDOUS OCCUPANCY. Defined in 308.

HAZARDOUS PRODUCTION MATERIAL (HPM). A solid, liquid or gas that has a degree of hazard rating in health, flammability or reactivity of 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 which are not hazardous.

HEAD JOINT. Vertical mortar joint placed between masonry units within the wythe at the time the masonry units are laid.

HEADER (BONDER). A masonry unit that connects two or more adjacent wythes of masonry.

HEALTH HAZARD. A classification of a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed persons. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes.

HEATING. See Chapter 28 and Standard Mechanical Code.

HEIGHT, BUILDING. Bears the meaning ascribed to that term in regulation 2 of the Development and Planning Regulations 1998 (Revision).

HEIGHT, STORY. The vertical distance from top to top of two successive finished floor surfaces.

HEIGHT, WALL. The vertical distance to the top measured from the foundation wall, or from a girder or other intermediate support of such wall.

HIGH TEMPERATURE ENERGY SOURCE. A fluid, gas, or vapor whose temperature exceeds 220°F (104°C).

HIGHLY TOXIC MATERIAL. A material which produces a lethal dose or lethal concentration which 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 of gas or vapor, or 2 milligrams per liter or less of mist, fume or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

MIXTURES of these materials with ordinary materials, such as water, may not warrant a classification of highly toxic. Any hazard evaluation which is required for the precise categorization of this type of material shall be performed by experienced, technically competent persons.

**HIGHLY VOLATILE LIQUID.** A liquid with a boiling point of less than 68°F (20°C).

**HORIZONTAL EXIT.** Way of passage from one building to an area of refuge in another building on approximately the same level, or a way of passage through or around a wall or partition to an area of refuge on approximately the same level in the same building, which affords safety from fire or smoke from an area of incidence and areas communicating therewith.

**HORIZONTAL SEPARATION.** The distance in feet measured from the building face to the closest interior lot line, to the centerline of a street, alley or public way, or to an imaginary line between two buildings on the same property.

**HOTEL.** Bears the meaning ascribed to that term in the Hotel Aid Law, 1995 (Revision).

**HPM EMERGENCY CONTROL STATION.** An approved location on the premises of an HPM Facility where signals from emergency equipment are received.

**HPM SEPARATE INSIDE STORAGE ROOM.** A room used for the storage of hazardous production material in containers, tanks, drums or other means, separated from other occupancies. Such rooms include:

- **HPM Inside Room.** A hazardous production material storage room totally enclosed within a building and having no exterior walls.
- **HPM Cutoff Room.** A hazardous production material storage room within a building and having at least one exterior wall.

**HPM SERVICE CORRIDOR.** A fully enclosed passage used for transporting hazardous production material from an HPM separate inside storage room or the exterior of the building to the perimeter wall of the fabrication area, and for purposes other than required exiting.

**ICE SENSITIVE STRUCTURES.** Open structures including, but not limited to, lattice structures, overhead lines, suspension and cable-stayed bridges, aerial cable systems (e.g. for ski-lifts and logging operations), amusement rides, open catwalks, ladders, railings, flagpoles and signs.

**IDLH (Immediately Dangerous to Life and Health).** A concentration of airborne contaminant, normally expressed in parts per million (ppm) or milligrams per cubic meter, which represents the maximum level from which one could escape within 30 minutes without any escape-impairing symptoms or irreversible health effects. This level is established by the National Institute of Occupational Safety and Health (NIOSH). If adequate data does not exist for precise establishment of IDLH data, an independent certified Industrial Hygienist, Industrial Toxicologist, or appropriate regulatory agency shall make such determination.

**ILLUMINATION UNIFORMITY RATIO.** The illumination uniformity ratio as determined by the following formula: Maximum illumination at any point divided by minimum illumination at any point.

**IMMISCIBLE.** Not capable of forming a solution or dispersion with another component.

**INDUSTRIAL OCCUPANCY.** Defined in 307.

**INSTITUTIONAL OCCUPANCY.** Defined in 309.

**INSULATING CONCRETE FORM (ICF).** A concrete forming system using stay-in-place forms of rigid foam plastic insulation, a hybrid of cement and foam insulation, a hybrid of cement and wood chips, or other insulating material for constructing cast-in-place concrete walls.

**INTERIOR LOT LINE.** See "Property Line, Common."

**INTERLAYMENT.** A layer of felt or non-bituminous saturated felt not less than 18 inches (457 mm) wide, shingled between each course of a wood shake roof covering.

**INVERTED PENDULUM-TYPE STRUCTURES.** Structures which have a large portion of their mass concentrated near the top and thus have essentially one degree of freedom in horizontal translation. The structures are usually T-shaped with a single column supporting the beams or slab at the top.

**IRRITANT.** A chemical which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. A chemical is a skin irritant if, when tested on the intact skin of albino rabbits by the methods of CPSC 16 CFR 1500.41 for four hours exposure or by other appropriate techniques, it results in an empirical score of 5 or more. A chemical is an eye irritant if so
determined under the procedure listed in CPSC 16 CFR 1500.42 or other appropriate techniques.

**JOINT.** The linear opening between adjacent fire resistant assemblies which is also a division of a building that allows independent movement of the building in any plane which may be caused by thermal, seismic, wind loading or any other loading.

**LABELED.** In relation to devices, equipment or materials means having affixed thereto a label, seal, symbol or other identifying mark of a testing laboratory, inspection agency or other organization recognized by the Building Official and which is concerned with product evaluation, maintains periodic inspection of production of the thing concerned and by label the manufacturer attests to compliance with applicable generally recognized standards.

**LIGHT DIFFUSING SYSTEM.** A suspended construction consisting in whole or in part of lenses, panels, grids or baffles suspended below independently mounted electrical lighting sources.

**LIGHT FRAMED WALL.** A wall with wood or steel studs.

**LIGHTWEIGHT AGGREGATE CONCRETE.** Concrete made with aggregates of expanded clay, shale, slag, or slate or sintered fly ash, and weighing 85 to 115 pcf (1360 to 1840 kg/m3).

**LINTEL.** The member placed over an opening in a wall which supports the wall construction above.

**LISTED.** In relation to equipment or materials included in a list published by a testing laboratory, inspection agency or other organization recognized by the Building Official to be of standards satisfactory to him which is concerned with product evaluation and which maintains periodic inspection of production of equipment or materials, if it is stated in such lists either that the equipment or material meets recognized standards or has been tested and found suitable for use in a specified manner. The means for identifying listed equipment may vary for each testing laboratory, inspection agency, or other organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The Building Official should utilize the system employed by the listing organization to identify a listed product.

**LIVE LOAD.** The weight superimposed by the use and occupancy of the building, not including crane load, dead load, earthquake load, snow load, or wind load.

**LOAD DURATION.** The period of continuous application of a given load, or the aggregate of periods of intermittent applications of the same load.

**LOT.** Has the meaning ascribed to that term in the Registered Land Law, 1995 (Revision).

**MAIN WIND FORCE RESISTING SYSTEM (MWFRS).** An assemblage of major structural elements assigned to provide support for secondary members and cladding. The system primarily receives wind loading from more than one surface.

**MALL.** A roofed or covered common pedestrian area within a covered mall building which serves as access for two or more tenants.

**MARQUEE SIGN.** A projecting sign attached to or hung from a canopy or covered structure projecting from and supported by a building, when such canopy or covered structure extends beyond the building, building line or property line.

**MASONRY.** That form of construction composed of stone, brick, concrete, gypsum, hollow clay tile, concrete block or tile, glass block or other similar building units or materials or a combination of these materials laid up unit by unit and set in mortar.

**MASONRY, FILLED CELL.** That form of solid masonry in which the aligned, unobstructed vertical cells of hollow units are filled with grout.

**MASONRY, GROUTED.** That form of solid masonry in which the interior vertical spaces are filled with grout, except that cores of solid masonry units and end spaces of stretcher units need not be grouted.

**MASONRY, HOLLOW.** Construction built with masonry units whose net cross-sectional area in every plane parallel to the bearing surface is less than 75% of its gross cross-sectional area measured in the same plane.

**MASONRY, SOLID.** Construction built with masonry units whose net cross-sectional area in every plane parallel to the bearing surface is 75% or more of its gross cross-sectional area measured in the same plane.

**MEANS OF EGRESS.** A continuous and unobstructed way of exit travel from any point in a building or structure to a public way, consisting of three separate and distinct parts: (1) the way of exit access, (2) the exit, and (3) the way of exit discharge. A means of egress comprises the vertical and horizontal ways of travel and shall include the intervening room space, doors, corridors, passageways, balconies, stairs, ramps, enclosures, lobbies, horizontal exits, courts and yards. See "Exit" and "Exit Access."

**MEANS OF ESCAPE.** A way out of a building or structure that does not conform to the strict definition of means of egress but does provide an alternate way out. A means of escape consists of a door, stairway, passage, or hall providing
a way of unobstructed travel to the outside at street or ground level that is independent of and remotely located from the means of egress. It may also consist of a passage through an adjacent non-lockable space, independent of and remotely located from the means of egress, to any approved exit.

METAL ROOF PANEL. An interlocking metal sheet having a minimum installed weather exposure of 3 sq ft (0.3 m²) per sheet.

METAL ROOF SHINGLE. An interlocking metal sheet having an installed weather exposure less than 3 sq ft (0.3 m²) per sheet.

MEZZANINE. One or more intermediate levels between the floor and ceiling of a story, meeting the requirements of 503.2.3.

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.

MISCIBLE. Capable of forming a solution or dispersion with another component.

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.

MOTEL. See "Hotel."

MULTI-STORY DWELLING UNIT. A dwelling unit with habitable or bathroom space located on more than one story.

MULTIPLE DWELLING. See "Apartment House."

NONCOMBUSTIBLE BUILDING MATERIAL. A material which meets either of the following requirements:
1. Materials which pass the test procedure set forth in ASTM E 136.
2. Materials having a structural base of noncombustible materials as defined in 1, with a surfacing not more than 1/8 inch (3.17 mm) thick which has a flamespread rating not greater than 50 when tested in accordance with ASTM E 84.

The term noncombustible does not apply to the flamespread characteristics of interior finish or trim materials. A material shall not be classed as noncombustible which is subject to increase in combustibility or flamespread rating beyond the limits herein established through the effects of age, moisture or other atmospheric conditions.

OCCUPANCY. The purpose for which a building, or part thereof, is used or intended to be used.

OCCUPANCY, MIXED. A building used for two or more occupancies classified in different occupancy groups.

OCCUPANT CONTENT. The actual number of total occupants permitted to occupy a floor area in accordance with the maximum capacity of the exits serving that floor area.

OCCUPANT LOAD. The calculated minimum number of persons for which the means of egress of a building or portion thereof is designed, based on Table 1003.1.

OCCUPIABLE ROOM. 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, light, and ventilation facilities meeting the requirements of this code.

OPEN AIR GRANDSTANDS AND BLEACHERS. Seating facilities which are located so that the side toward which the audience faces is unroofed and without an enclosing wall.

OPEN BUILDING. A building having all walls at least 80% open.

OPENINGS. Windows, doors, skylights or other apertures in the building envelope (roof and exterior wall surfaces) that are not designed as components and cladding.

ORGANIC PEROXIDE. An organic compound that contains the bivalent -0-0- 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 may present an explosion hazard (detonation or deflagration) or they may be shock sensitive. They may also decompose into various unstable compounds over an extended period of time.

OWNER. Any person, agent, firm or corporation having a legal or equitable interest in the property.

OXIDIZER. A chemical other than a blasting agent or explosive that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

P-DELTA EFFECT. The secondary effect on shears and moments of frame members due to the action of the vertical loads induced by displacement of the building frame resulting from lateral forces.

PANIC HARDWARE. A door latching assembly incorporating a device which releases the latch upon the application of a force in the direction of exit travel.
PARTIALLY ENCLOSED BUILDING. A building which complies with all of the following conditions:
1. The total area of openings in a wall or wall and roof that receives positive external pressure exceeds the sum of the areas of openings in the balance of the building envelope (walls and roof); and
2. The total area of openings in a wall or wall and roof that receives positive external pressure exceeds 5% of the area of that wall or wall and roof; and
3. The openings in the balance of the building envelope do not exceed 20%.

The three conditions can be expressed by the following equations:

\[ A_0 \geq A_{oi} \quad \text{and} \quad A_0 > 0.05 A_g \quad \text{and} \quad A_{oi}/A_{gi} \leq 0.20 \]

where,
- \( A_0 \) = the total area of openings in a wall or wall and roof that receives positive external pressure, in sq ft
- \( A_g \) = the gross area of that wall or wall and roof in which \( A_0 \) is identified, in sq ft
- \( A_{oi} \) = the sum of the areas of openings in the building envelope (walls and roof) not including \( A_0 \), in sq ft
- \( A_{gi} \) = the sum of the gross surface areas of the building envelope (walls and roof) not including \( A_{oi} \), in sq ft

PARTITION. An interior wall, other than folding or portable that subdivides spaces within any story, attic or basement of a building.

PARTITION, PARTIAL. A partition with a maximum height of 72 inches (1829 mm).

PENETRATION. An opening created in a membrane or assembly to accommodate penetrating items for electrical, mechanical, plumbing, environmental and communication systems.
- Through Penetration. An opening that passes through an entire assembly.
- Membrane Penetration. An opening made through one side (wall, floor or ceiling membrane) of an assembly.

PENETRATION FIRESTOP SYSTEM. An assemblage of specific materials or products that are designed, tested and fire rated to resist, for a prescribed period of time, the spread of fire through penetrations.

PENTHOUSE. An enclosed, unoccupied structure above the roof of a building, other than a rooftop structure or bulkhead, occupying not more than one-third of the roof area.

PERLITE CONCRETE. 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.

PERMANENT SEATING. Seating facilities, which remain at a location for more than 90 days. Applies to reviewing stands, grandstands and bleachers.

PERMISSIBLE EXPOSURE LIMIT (PEL). The maximum permitted 8-hour time weighted average concentration of an airborne contaminant. The maximum permitted time weighted average exposures to be utilized are those published in OSHA 29 CFR 1910.1000.

PERMIT. An official document or certificate issued by the building official authorizing performance of a specified activity.

PERSON. A natural person, his heirs, executors, administrator, or assigns, or a firm, partnership or corporation and its successors or assigns, or the agent of any of the aforesaid.

PERSONAL CARE SERVICES. The care of residents who do not require chronic or convalescent medical or nursing care. Personal care involves responsibility for the safety of the resident while inside the building. Personal care might include daily awareness by the management of the resident's functioning and whereabouts, making and reminding a resident of appointments, the ability and readiness for intervention in the event of a resident experiencing a crisis, supervision in the areas of nutrition and medication, and actual provision of transient medical care.

PHYSICAL HAZARD. A classification of a chemical for which there is scientifically valid evidence that it is a combustible liquid, compressed gas, cryogenic, explosive, flammable gas, flammable liquid, flammable solid, organic peroxide, oxidizer, pyrophoric, unstable (reactive) or water reactive material.

PHYSICALLY DISABLED PERSON. An individual who has a physical impairment, including impaired sensory, manual, or speaking abilities, that results in a functional limitation in gaining access to and using a building or facility.

PINRAIL. A rail on or above a stage through which belaying pins are inserted and to which lines are fastened.

PLASTIC, APPROVED. A thermoplastic, thermosetting or reinforced plastic material which has self-ignition temperature 650°F (343°C) or greater when tested in accordance with ASTM D 1929, a smoke density rating no greater than 450 when tested in accordance with ASTM E 84 in the way intended for use, or a smoke density rating no greater than 75 when tested in the thickness intended for use by ASTM D
2843 and which meets one of the combustibility classifications listed below:

**CC 1.** Plastic materials, which have a burning extent of 1 inch (25.4 mm) or less when tested in nominal .060 inch (1.52 mm) thickness by ASTM D 635.

**CC 2.** Plastic materials which have a burning rate of 2 1/2 inches (64 mm) per minute or less when tested in nominal .060 inch (1.52 mm) thickness by ASTM D 635 or in the thickness intended for use.

**PLASTIC, GLASS FIBER REINFORCED.** Plastic reinforced with glass fiber having not less than 20% of glass fibers by weight.

**PLASTIC, GLAZING.** Plastic materials, which are glazed or set in frame or sash and not held by mechanical fasteners, which pass through the glazing material.

**PLASTIC, ROOF PANELS.** Plastic materials which are fastened to structural members or to structural panels or sheathing and which are used as light transmitting media in the plane of the roof.

**PLASTIC, WALL PANELS.** Plastic materials which are fastened to structural members or to structural panels or sheathing and which are used as light-transmitting media in exterior walls.

**PLATFORM.** An area within a building used for entertainment or presentation wherein there are limited combustible materials or finishes.

**PLATFORM, PERMANENT.** A platform used within an area for more than 30 days.

**PLENUM.** An air compartment or chamber to which one or more ducts are connected and which forms part of an air distribution system.

**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.

**PRIMARY CONTAINMENT.** The first level of containment, i.e., the inside portion of that container which comes into immediate contact on its inner surface with the material being contained.

**PROJECTION SIGN.** An outdoor advertising display sign affixed to any building wall or structural and extending beyond the building wall, structure, building line or property line more than 12 inches (305 mm).

**PROPELLANT.** A liquefied or compressed gas that expels the contents from an aerosol container when the valve is actuated.

**PROPERTY LINE, ASSUMED.** The centerline of street where an exterior building wall faces a street, or an imaginary line between the exterior walls of two buildings on the same lot.

**PROPERTY LINE, COMMON.** A line dividing one lot from another.

**PROSCENIUM WALL.** The wall that separates the stage from the auditorium or house.

**PUBLIC SPACE.** A legal open space on the premises, accessible to a public way or street, such as yards, courts or open spaces permanently devoted to public use, which abuts the premises and is permanently maintained accessible to the fire department and free of all encumbrances that might interfere with its use by the fire department.

**PUBLIC WAY.** Any street, alley or other parcel of land open to the outside air, deeded, dedicated or otherwise permanently appropriated to the public for public use and having a clear and unobstructed width and height of not less than 10 ft (3048 mm).

**PYROPHORIC.** A chemical that will spontaneously ignite in air at or below a temperature of 130°F (54°C).

**REACTIVE MATERIALS.** Those materials, which can enter into a hazardous chemical reaction with other stable or unstable materials.

**READILY ACCESSIBLE.** Having direct access without the need of removing any panel, door or similar covering of the item described, and without requiring the use of portable ladders, chairs, etc. See "Accessible."

**RECOVERING.** Preparing the existing roof covering (as opposed to the removal of the existing roof covering) and installing a new roof covering.

**REPAIR.** The reconstruction or renewal of any part of an existing building for the purpose of its maintenance.

**REPLACEMENT.** Removing the existing roof covering, repairing any damaged substrate, and installing a new roof covering.

**REEROOFING.** The process of recovering or replacing an existing roof covering. See "Roof Recover" and "Roof Replacement."

**RESIDENT SLEEPING UNIT.** A single unit providing sleeping facilities for one or more persons. Resident sleeping units can also include permanent provisions for living, eating and sanitation, but do not include kitchen facilities.
RESIDENTIAL AIRCRAFT HANGAR. An accessory building less than 2,000 sq ft (186 m$^2$) in area, constructed on a one or two family residential property where aircraft of the owner is stored. Such use will be considered as a residential accessory use incidental to the dwelling.

RESIDENTIAL CARE/ASSISTED LIVING OCCUPANCIES. A building or part thereof housing six or more persons, on a 24-hour basis, who because of age, mental disability or other reasons, live in a supervised residential environment, which provides personal care and supportive services. The occupants are mostly capable of responding to an emergency situation without assistance from staff. And this occupancy sub classification shall include residential board and care facilities, assisted living facilities, halfway houses, group homes, congregate care facilities, social rehabilitation facilities, alcohol and drug abuse centers, and convalescent facilities.

RESIDENTIAL HOUSING AREAS. Includes sleeping areas and any contiguous day room, group activity space or other common spaces for customary access of residents.

RESIDENTIAL OCCUPANCY. Defined in 311.

RESILIENT STABLE MOUNTING SYSTEM. A system incorporating helical springs, air cushions, rubber-in-shear mounts, fiber-in-shear mounts, or other comparable approved systems. The force displacement ratios are equal in the horizontal and vertical directions.

RESTRAINING DEVICE. A device used to limit the vertical or horizontal movement of the mounting system due to earthquake motions.

Elastic. A fixed restraining device that incorporates an elastic element to reduce the seismic forces transmitted to the structure due to impact from the resilient mounting system.

Fixed. A non-yielding or rigid type of restraining device.

REVIEWING STANDS. Elevated platforms accommodating not more than 50 persons. Seating facilities, if provided, are normally in the nature of loose chairs. Reviewing stands accommodating more than 50 persons are grandstands.

ROAD. A road as defined from time to time in the Roads Law, (2000 Revision)

ROOF ASSEMBLY. 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, 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, not including its supporting members or vertical supports.

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 SIGN. An outdoor advertising display sign erected, constructed, or maintained above the roof of any building.

ROOFTOP STRUCTURE. An enclosed structure on or above the roof 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 of the unit length.

SAFE DISPERsal AREA. An area, which will accommodate a number of persons equal to the total capacity of the stand and building which it serves in such a manner that no person within the area need be closer than 50 ft (15.2 m) from the stand or building. Dispersal areas are based on an area of not less than 3 sq ft (0.28 m$^2$) per person. Applies to reviewing stands, grandstands and bleachers.

SALLYPORT (Security Vestibule). A compartment provided with two or more doors where the intended purpose is to prevent continuous and unobstructed passage by allowing the release of only one door at a time.

SAND-LIGHTWEIGHT CON crete. Concrete made with a combination of expanded clay, shale, stage, or slate or sintered fly ash and natural sand. Its unit weight is generally between 105 and 120 pcf (1680 and 1920 kg/m$^3$).

SCUPPER. An opening in a wall or parapet that allows water to drain from a roof.

SECONDARY CONTAINMENT. The level of containment that is external to and separate from primary containment.

SECURE. Safe from intrusion or contained separately to prevent mixing with other materials.

SEISMIC ACTIVATED. An interactive restraining device that is activated by earthquake motion.

SEISMIC LOAD. The forces superimposed on a building or structure by an earthquake.
SEISMIC RESISTING SYSTEM. That part of the structural system that has been considered in the design to provide the required resistance to the seismic forces prescribed herein.

SELF-CLOSING. As applied to a fire door or other opening, means normally closed and equipped with an approved device which will insure closing after having been opened for use.

SENSITIZER. A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.

SEPARATE GAS STORAGE ROOM. A separate enclosed area, which is part of or attached to a building and is utilized for the storage of toxic or highly toxic compressed or liquefied gases.

SERVICE STATION. Defined in 404.2.

SHAFT. A vertical opening extending through one or more stories of a building.

SHALL. As used in this code, is mandatory.

SHEAR WALL. A wall, bearing or nonbearing, designed to resist seismic forces, from other than its own mass, acting in the plane of the wall.

SHEARWALL SEGMENT. A wall or portion thereof which transfers in-plane lateral shear loads to a wall or foundation below and resists overturning.

SHINGLE SIGN. A projection or wall sign not over 6 sq ft (0.56 m²) in area, constructed of metal or other noncombustible material attached securely to a building and not projecting more than 24 inches (610 mm) over public property.

SHOTCRETE. Mortar or concrete which is pneumatically projected at a high velocity onto a surface.

SILICEOUS AGGREGATE CONCRETE. Concrete made with normal weight aggregates consisting mainly of silica or compounds other than calcium or magnesium carbonate.

SINGLE PLY MEMBRANE. A roofing membrane that is field applied using one layer of membrane material (either homogeneous or composite) rather than multiple layers.

SITE. A parcel of land bounded by a property line or a designated portion of a public right-of-way.

SMOKE DAMPER. A listed device that meets the requirements of UL 555S and is designed to resist the passage of air and smoke.

SMOKE DETECTOR. An approved listed detector sensing either visible or invisible particles of combustion.

SMOKE DETECTOR, MULTIPLE-STATION. Single station smoke detectors, which are capable of being interconnected such that actuation of one causes all integral or separate audible alarms to operate.

SMOKE DETECTOR, SINGLE-STATION. An assembly incorporating the detector, control equipment and alarm sounding device in one unit, which is operated from a power supply either in the unit, or obtained at the point of installation.

SMOKE-PROTECTED ASSEMBLY SEATING. Seating served by a means of egress that is not subject to smoke accumulation within or under a structure.

SMOKEPROOF ENCLOSURE. An exit consisting of a vestibule and continuous stairway enclosed from the highest point to the lowest point and designed so that the movement of products of combustion produced by a fire occurring in any part of the building into the smoke proof tower is limited.

SNOW LOAD. The forces superimposed on a building or structure resulting from the accumulation of snow.

SPECTACULAR SIGN. An outdoor advertising display sign, advertising copy usually animated, constructed of metal, wired for lights or luminous tubing, or both, with copy action controlled by the flashed circuit breakers or matographs and attached on an open face steel structure built especially for the purpose. Spectacular signs may be built upon the ground, attached to a wall, or above the roof, or projecting from a wall, provided that such signs meet the requirements of the provisions of this code governing ground, roof, wall, projection or marquee sign, depending upon where such signs are built, as set forth below. Spectacular signs shall be illuminated with electricity only.

SPLICE. The result of a factory or field method of joining or connecting two or more lengths of a fire resistant joint system into a continuous entity.

SPRINKLERED. Equipped with an approved automatic sprinkler system properly maintained.

STACK BOND. The placement of masonry units in a bond pattern such that head joints in successive courses are vertically aligned. For the purpose of this code, requirements for stack bond shall apply to all masonry laid in other than running bond.

STAGE. A space within a building used for entertainment or presentations. 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 resistant
rated construction. 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.

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 in a building or structure.

STANDPIPE. An arrangement of piping, valves, hose outlets and allied equipment installed in a building or structure with outlets located in such a manner that water can be discharged through hose and nozzles for the purpose of extinguishing a fire. Standpipes are classified as either one of four classes as follows:

Class I. For use by fire departments and those trained in handling heavy fire streams (2 1/2-inch (64 mm) hose).
Class II. For use primarily by the building occupants until the arrival of the fire department (1 1/2-inch (38 mm) hose).
Class III. For use by either fire departments and those trained in handling heavy hose streams (2 1/2-inch (64 mm) hose) or by the building occupants (1 1/2-inch (38 mm) hose).
Combined Systems. One where the water piping serves both 2 1/2-inch (64 mm) outlets for fire department use and outlets for automatic sprinklers.

STANDPIPE, DRY. A system designed to have piping contain water only when the system is being used. The following are three types of dry standpipes.

Automatic. A standpipe system so arranged through the use of approved devices as to admit water to the system automatically by opening a hose valve.
Semi-automatic. A standpipe system arranged to admit water to the system through manual operation of approved remote control devices located at each hose station.
Manual. A standpipe system with no permanent water supply connected; such a system is supplied solely through the fire department connection.

STANDPIPE, WET. A system having supply valve open and water pressure maintained at all times. The following are types of wet standpipes.

Automatic. A standpipe system having supply valve open and water pressure maintained at all times.
Manual. A standpipe system connected to a small water supply for maintaining water within the system, but does not have a water supply capable of delivering the system demand, also known as a filled or printed standpipe.

STONE MASONRY. Masonry composed of field, quarried, or cast stone units bonded by mortar.

STONE MASONRY, ASHLAR. Stone masonry composed of rectangular units having sawed, dressed, or squared bed surfaces and bonded by mortar.

STONE MASONRY, RUBBLE. Stone masonry composed of irregular shaped units bonded by mortar.

STORY. That portion of a building included between the upper surface of a floor and upper surface of the floor or roof next above.

STORY DRIFT RATIO. The story drift divided by the story height.

STORY SHEAR. The summation of design lateral forces at levels above the story under consideration.

STREET. Any public thoroughfare, street, avenue, boulevard, park or space more than 20 ft (6096 mm) wide which has been dedicated or deeded to the public for public use.

STREET LINE. A lot line dividing a lot from a street.

STRUCTURAL WORK OR ALTERATION. The installation or assembly of any new structural components, or any change to existing structural components, in a system, building, or structure.

STRUCTURE. That which is built or constructed.

T RATING. The time period that the penetration firestop system, including the penetrating item, limits the maximum temperature rise to 325 degrees F above its initial temperature through the penetration on the nonfire side, when tested in accordance with ASTM E 814.

TANK. A vessel containing more than 60 gallons (227 L).

TANK, PORTABLE. Any packaging over 60 U.S. gallons (227 L) capacity and designed primarily to be loaded into or on or temporarily attached to a transport vehicle or ship and equipped with skids, mounting or accessories to facilitate handling of the tank by mechanical means. It does not include any cylinder having less than a 1,000 lb (454 kg) water capacity, cargo tank, tank car tank or trailers carrying cylinders of over 1,000 lbs (454 kg) water capacity.

TANK, STATIONARY. Any packaging designed primarily for stationary installations not intended for loading, unloading or attachment to a transport vehicle as part of its normal operation in the process of use. It does not include cylinders having less than 1,000 lb (454 kg) water capacity.

TECHNICALLY INFEASIBLE. An alteration of a building or a facility that has little likelihood of being accomplished because existing structural conditions would require removing or altering a loadbearing member which is an essential part of the structural frame, or because other existing physical or site constraints prohibit modification or addition of elements,
spaces, or features which are in full and strict compliance with the minimum requirements for new construction and which are necessary to provide accessibility.

**TENANT.** Any person, agent, firm, corporation or division, who uses or occupies land, a building, or portion of a building by title, under a lease, by payment of rent, or who exercises limited control over the space.

**TENANT SEPARATION.** A partition or floor/ceiling assembly or both between tenants.

**TENSIONED MEMBRANE STRUCTURE.** A non-pressurized membrane structure wherein the membrane is prestressed and the structural support system include cables and/or rigid elements to maintain the structural form.

**THEATER.** A building, or part thereof, which contains an assembly hall with or without a stage, which may be equipped with curtains and permanent stage scenery or mechanical equipment adaptable to the showing of plays, operas, motion pictures, performances, spectacles and similar forms of entertainment.

**THERMOPLASTIC MATERIAL.** A plastic material which is capable of being repeatedly softened by increase of temperature and hardened by decrease of temperature.

**THERMOSETTING MATERIAL.** A plastic material which is capable of being changed into a substantially non-reformable product when cured.

**THROAT.** The throat of a fireplace is a tapered passageway that begins above the top of the firebox walls and terminates at the damper.

**TIE, WALL.** Metal connector which connects wythes of masonry walls together.

**TOWNHOUSE.** A single family dwelling constructed in a series or group of attached units with property lines separating each unit.

**TOXIC MATERIAL.** Material which produces a lethal dose or a lethal concentration within any of the following categories:

1. A chemical or substance 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 or substance 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 two and three kilograms each.
3. A chemical or substance that has a median lethal concentration (LC50) in air more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each. Mixtures of these materials with ordinary materials such as water may not warrant a classification of highly toxic. Any hazard evaluation, which is required for the precise categorization of this type of material, shall be performed by experienced, technically competent persons.

**UNDERLAYMENT.** One or more layers of felt, sheathing paper, non-bituminous saturated felt, or other approved material over which a steep-slope roof covering is applied.

**UNSTABLE (Reactive) MATERIALS.** Those materials, other than explosives, 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 non-compatible materials.

**USABLE CRAWL SPACE.** A crawl space designed to be used for equipment or storage.

**VALUATION OR VALUE.** When applied to a building, means the estimated cost to replace the building in kind.

**VENGER.** A facing attached to a wall for the purpose of providing ornamentation, protection, or insulation, but not counted as adding strength to the wall.

**VERMICULITE CONCRETE.** A lightweight 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 30pcf (480 kg/m³).

**VERTICAL OPENING.** An opening through a floor or roof.

**WALKWAY, COVERED.** A roofed, unobstructed walkway connecting buildings and used as a means of travel by persons and where less than 50% of the perimeter is enclosed and the maximum width perpendicular to the direction of travel is less than 30 ft (9144 mm).

**WALKWAY, ENCLOSED.** A roofed, unobstructed walkway connecting buildings and used as a means of travel by persons and where 50% or more of the perimeter is
enclosed and the maximum width perpendicular to the
direction of travel is less than 30 ft (9144 mm).

WALKWAY, TUNNELED. An unobstructed underground
walkway connecting buildings and used as a means of travel
by persons.

WALL, BEARING. A wall supporting any vertical load in
addition to its own weight.

WALL, CAVITY. A wall built of masonry units or of plain
concrete, or a combination of these materials, so arranged as
to provide a continuous air space within the wall, and in
which the inner and outer wythes of the wall are tied together
with metal ties.

WALL, COMPOSITE MASONRY. A multiple-wythe wall
in which at least one of the wythes is dissimilar to the other
wythe or wythes with respect to type or grade of masonry unit
or mortar and so bonded as to exert a common action under
load.

WALL, CURTAIN. A nonbearing wall between columns or
piers which is not supported by girders or beams, but is sup-
pported on the ground.

WALL, EXTERIOR. A wall, bearing or nonbearing, which
is used as an enclosing wall for a building, other than a party
wall or fire wall.

WALL, FOUNDATION. A wall below the first floor
extending below the adjacent ground level and serving as
support for a wall, pier, column or other structural part of a
building.

WALL, HOLLOW MASONRY. A wall built of masonry
units so arranged as to provide an air space within the wall,
and in which the inner and outer wythes of the wall are bond-
ed together with masonry units.

WALL, MASONRY VENEER. A wall having a facing of
masonry units securely attached to the backing for the
purpose of providing ornamentation, protection, or insulation,
but not so bonded to exert common action under load.

WALL, NONBEARING. A wall which supports no vertical
load other than its own weight.

WALL, PANEL. A nonbearing wall in skeleton or framed
construction, built between columns or piers and wholly sup-
ported at each story.

WALL, PARAPET. That part of any wall entirely above the
roof line.

WALL, PARTY. A firewall on an interior lot line used or
adapted for joint service between two buildings.
CHAPTER 3
OCCUPANCY CLASSIFICATION

SECTION 301
GENERAL

301.1 Scope. Provisions of this chapter shall govern the classification of building occupancies.

301.2 Occupancy or use categories. Every new and existing building, structure or part thereof shall, for the purpose of this code, be classified according to its use, or occupancy as a building or structure of one of the following occupancy groups:

- Group A - Assembly (see 304)
- Group B - Business (see 305)
- Group E - Educational (see 306)
- Group F - Factory Industrial (see 307)
- Group H - Hazardous (see 308)
- Group I - Institutional (see 309)
- Group M - Mercantile (see 310)
- Group R - Residential (see 311)
- Group S - Storage (see 312)

301.3 Uncertain classification. Each occupancy group is intended to include buildings as hereinafter defined and those of similar character or use. Wherever there is any uncertainty as to the classification of a building, the building official shall determine the classification within which it falls, according to the life safety and relative fire hazard involved.

SECTION 302
DEFINITIONS

For definitions, see Chapter 2.

SECTION 303
MIXED OCCUPANCIES

303.1 Multiple occupancies. A building that is used for two or more occupancies, classified within different occupancy groups, shall be considered a mixed occupancy building.

Exception: A building containing two or more occupancies, none of them Group H, may be considered a single occupancy when:

1. The required type of construction for the building is determined by applying the height and area limitations for each of the applicable occupancy groups to the entire building with the most restrictive type of construction requirements being applied, and
2. The entire building conforms with the most restrictive occupancy group fire protection requirements, as determined by Chapter 7 and 8, and
3. The entire building conforms with the most restrictive occupancy group sprinkler, standpipe and alarm system requirements, as determined by Chapter 9, and
4. All other requirements of this code are applied to each portion of the building based on the use of that space.

303.2 Height and area. A mixed occupancy building shall be governed by the height and area limitations applying to the principal intended use. However each portion of the building shall conform to all other requirements of this code for the occupancy contained therein. Accessory occupancies shall not exceed the area limitation nor be located at a height greater than that permitted for such occupancy group in the type of construction being used.

SECTION 304
ASSEMBLY OCCUPANCY- GROUP A

304.1 Scope

304.1.1 Group A occupancy is the use of a building or structure, or any portion thereof, for the gathering together of persons for purposes such as civic, social or religious functions or for recreation, or for food or drink consumption or awaiting transportation.

304.1.2 Group A occupancy shall include, among others, the following:

- Amusement Park Buildings
- Passenger Depots
- Auditoriums
- Public Assembly Halls
- Churches
- Recreation Halls
- Dance Halls
- Restaurants
- Gymnasiums
- Stadiums and Grandstands
- Motion Picture Theaters
- Tents for Assembly
- Theaters for Stage
- Museums
- Theaters for Stage Production

304.2 Subclassifications

304.2.1 Assembly occupancies shall be divided into two subclassifications as set forth in this section, both of which shall comply with the requirements for Group A occupancy unless otherwise specified:

1. A-1: Large Assembly shall include theaters and other places of assembly with an occupant load of 1,000 or more persons. Large Assembly shall also include theaters and other places of assembly with a stage requiring proscenium opening protection and with an occupant load of 700 or more persons.
2. A-2: Small Assembly shall include theaters and other places of assembly with or without a stage requiring proscenium opening protection and with an occupant load of 100 or more persons, but with an occupant load less than designated for Large Assembly.
304.2.2 Assembly occupancies with an occupant load less than 100 persons shall be classified as Group B.

SECTION 305
BUSINESS OCCUPANCY - GROUP B

305.1 Scope
305.1.1 Group B occupancy is the use of a building or structure, or any portion thereof, for office, professional, or service type transactions including normal accessory storage and the keeping of records and accounts.

305.1.2 Group B occupancy shall include, among others, the following:
- Animal hospitals, kennels, pounds
- Automobile and other motor vehicle showrooms
- Automobile or other vehicle service stations
- Banks
- Barber shops
- Beauty shops
- Bowling alleys
- Carwashes
- Civic administration areas
- Clinics - outpatient
- Dry cleaning; pick-up and delivery stations and self-service
- Educational occupancies above High School
- Electronic data processing areas
- Florist and nurseries
- General post offices
- Greenhouses
- Laboratories; testing and research (nonhazardous)
- Laundries; pickup and delivery stations and self-service
- Libraries (other than school)
- Office buildings
- Police stations
- Print shops
- Professional services; attorney, dentists, physician, engineer, etc.
- Radio and Television Stations
- Telephone exchanges

305.1.3 Assembly occupancies with an occupant load less than 100 persons shall be classified as Group B.

Exception: Provisions of 403.1.3.4, 403.2, 403.3, 1019.10, 1019.11 and 3103 shall apply to buildings used for assembly purposes, regardless of occupant load.

305.1.4 Dry cleaning establishments using solvents which are nonflammable or nonflammable at ordinary temperatures and only moderately flammable at higher temperatures (Class IV System) shall be classified as Group B occupancy.

SECTION 306
EDUCATIONAL OCCUPANCY-GROUP E

306.1 Scope
306.1.1 Group E occupancy is the use of a building or structure, or any portion thereof, by six or more persons at any one time for educational purposes through the 12th grade.

306.1.2 Child care facilities which accommodate six or more children of any age who stay less than 24 hours per day shall be classified as Group E.

306.1.3 Parts of buildings used for the congregating or gathering of 100 or more persons in one room shall be classified as Group A occupancy, regardless of whether or not such gathering is of an educational or instructional nature.

306.1.4 Schools for business or vocational training shall be classified in the same occupancies and conform to the same requirements as the trade, vocation or business taught, provided the concentration of persons will not exceed that listed in 1003 for the occupancy classification used.

SECTION 307
FACTORY-INDUSTRIAL OCCUPANCY-GROUP F

307.1 Scope
307.1.1 Group F occupancy is use of a building or structure, or any portion thereof, for assembling, disassembling, repairing, fabricating, finishing, manufacturing, packaging or processing operations that are not otherwise classified in this code.

307.1.2 Group F occupancy shall include, among others, the occupancies listed in this section, but does not include buildings used principally for any purpose involving highly combustible, flammable, or explosive products or materials. See 308. Assembly Plant Mill Factory Processing Plant Manufacturing Plant

307.1.3 Portions of Group F occupancy involving highly combustible, flammable or explosive products or materials shall be properly ventilated, protected and separated from the remainder of the building in accordance with the appropriate NFPA Standard or the entire building will be classified as Hazardous occupancy. See 308.

SECTION 308
HAZARDOUS OCCUPANCY-GROUP H

308.1 Scope.
308.1.1 Group H occupancy is the principal use of a building or structure, or any portion thereof, that involves the manufacturing, processing, generation, storage, or other use of hazardous materials in excess of the exempt quantities listed in this section.

308.2 Subclassification
308.2.1 Group H hazardous occupancies shall be divided into HI through H4 according to the hazards presented by each material as described below:

H1: Buildings or parts thereof used for the manufacturing, processing, generation or storage of materials which present a detonation hazard. Detonation hazards include explosives, blasting agents, pyrotechnic special effect materials, display fireworks, 13G, (Class B, Special) and consumer fireworks, IAG, (Class C, Common) manufacturing, Class 4 liquid and solid oxidizers, unclassified detonatable organic peroxides, and
### TABLE 308.2C
**EXEMPT QUANTITIES OF H3 MATERIALS**

#### FLAMMABLE AND COMBUSTIBLE LIQUIDS IN CLOSED CONTAINERS PRESSURIZED AT 15 PSIG OR LESS (gal) ³

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>unprotected by sprinklers or cabinet</td>
<td>30</td>
<td>60</td>
<td>90</td>
<td>120</td>
<td>120</td>
<td>330</td>
<td>13,200</td>
<td>125</td>
<td>1,000</td>
<td>250</td>
<td>50</td>
<td>125</td>
<td>750</td>
<td>50</td>
<td>250</td>
<td>NL</td>
<td>50</td>
</tr>
<tr>
<td>within cabinet in unsprinklered building</td>
<td>60</td>
<td>120</td>
<td>180</td>
<td>240</td>
<td>240</td>
<td>660</td>
<td>26,400</td>
<td>250</td>
<td>2,000</td>
<td>500</td>
<td>100</td>
<td>250</td>
<td>250</td>
<td>1,000</td>
<td>100</td>
<td>500</td>
<td>10</td>
</tr>
<tr>
<td>in sprinklered building, not in cabinet</td>
<td>60</td>
<td>120</td>
<td>180</td>
<td>240</td>
<td>240</td>
<td>660</td>
<td>NIL</td>
<td>250</td>
<td>2,000</td>
<td>500</td>
<td>100</td>
<td>250</td>
<td>1,000</td>
<td>100</td>
<td>500</td>
<td>100</td>
<td>90</td>
</tr>
<tr>
<td>in sprinklered building, within cabinet</td>
<td>120</td>
<td>240</td>
<td>360</td>
<td>480</td>
<td>80</td>
<td>1,320</td>
<td>NIL</td>
<td>500</td>
<td>4,000</td>
<td>1,000</td>
<td>200</td>
<td>500</td>
<td>1,000</td>
<td>200</td>
<td>1,500</td>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

For SI: 1 lb = 0.4536 kg, 1 gal = 3.7854 L, 1 cu ft = 0.02832 m³.

**Notes:**
1. For storage requirements see Chapter 9 of the Standard Fire Prevention Code.
2. Containing not more than the exempt amounts of Class IA, IB, or IC Flammable liquids.
3. A conversion of 10 lbs/gal shall be used.
4. For baled combustible fibers the exempt quantities shall be 1,000 cu ft, 2,000 cu ft, 2,000 cu ft and 4,000 cu ft for the respective conditions.

### TABLE 308.2D
**EXEMPT QUANTITIES OF H4 MATERIALS**

#### HIGHLY TOXIC AND TOXIC SOLIDS AND LIQUID³ (lbs)

<table>
<thead>
<tr>
<th>CONDITIONS</th>
<th>HIGHLY TOXIC GASES ³ (cu ft)</th>
<th>TOXIC COMPRRESSSED GASES ³ (cu ft)</th>
<th>Highly Toxic</th>
<th>Toxic</th>
<th>Solids (lbs)</th>
<th>Liquids (gals)</th>
<th>Gases (cu ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>unprotected by sprinklers or cabinets</td>
<td>0</td>
<td>650</td>
<td>1</td>
<td>500</td>
<td>5,000</td>
<td>500</td>
<td>650</td>
</tr>
<tr>
<td>within cabinet in unsprinklered building</td>
<td>20</td>
<td>1-300</td>
<td>2</td>
<td>1,000</td>
<td>10,000</td>
<td>1,000</td>
<td>1,300</td>
</tr>
<tr>
<td>in sprinklered building, not in cabinet</td>
<td>0</td>
<td>1,300</td>
<td>2</td>
<td>1,000</td>
<td>10,000</td>
<td>1,000</td>
<td>1,300</td>
</tr>
<tr>
<td>in sprinklered building, within cabinet</td>
<td>40</td>
<td>2,600</td>
<td>4</td>
<td>2,000</td>
<td>20,000</td>
<td>2,000</td>
<td>2,600</td>
</tr>
</tbody>
</table>

For SI: 1 lb = 0.4536 kg, 1 gal = 3.7854 L, 1 cu ft = 0.02832

**M5. Notes:**
1. No exempt amounts are permitted in Group A, M, R and offices in Group B occupancies.
2. Except for cylinders not exceeding 20 cu ft stored within a gas storage cabinet or fume hood, no exempt amounts are permitted in Group E or I occupancies or in classrooms.
3. A conversion of 10 lbs/gal shall be used.
4. Compressed, chlorine gas shall have an exempt amount of 810 cu ft.
SECTION 309
INSTITUTIONAL OCCUPANCY - GROUP I

309.1 Group 1 Unrestrained Occupancy. Group 1 Unrestrained includes buildings or portions thereof used for medical, surgical, psychiatric, nursing, or custodial care on a 24 hour basis of six or more persons who are not capable of self-preservation and shall include among others:
- Detoxification Facilities
- Hospitals
- Mental hospitals
- Nursing homes
  (both intermediate care facilities and skilled nursing facilities).
Facilities such as the above with five or less persons not ancillary to other uses shall be classified as a residential occupancy.

309.2 Group I Restrained Occupancy. Group I Restrained includes buildings or portions thereof which provide sleeping accommodations for six or more persons under some degree of restraint or security who are generally incapable of self-preservation due to security measures not under the occupant's control and shall include among others:
- Correctional Institutions
- Detention Centers
- Jails
- Reformatories

Exception: Group I Restrained qualifying for Use Condition I may be classified as a Group R occupancy.

SECTION 310
MERCANTILE OCCUPANCY-GROUP M

310.1 Scope. Group M occupancy is the use of a building or structure or any portion thereof, for the display and sale of merchandise including stocks of goods, wares or merchandise incidental to such purposes and accessible to the public and shall include, among others, the following: Department stores Drug stores Markets Retail stores Sales rooms Shopping centers Wholesale stores (other than warehouses)

SECTION 311
RESIDENTIAL OCCUPANCY-GROUP R

311.1 Scope. Group R occupancy is the use of a building or structure, or any portion thereof, for sleeping accommodations not classed as a Group I occupancy.

311.2 Subclassifications. Group R occupancies shall include, among others, the following:

R1: Residential occupancies where the occupants are primarily transient in nature including:
  - Guest housing (transient)
  - Hotels
  - Motels

R2: Multiple dwellings where the occupants are primary permanent in nature, including:
  - Apartment houses
  - Convents
  - Dormitory facilities which accommodate six or more persons of more than 2 1/2 years of age who stay more than 24 hours.
  - Fraternities and sororities
  - Monasteries
  - Guest houses (not transient)

R3: Residential occupancies including the following:
  - Child care facilities which accommodate five or less children of any age for any time period.
  - One and two family dwellings where the occupants are primarily permanent in nature and not classified as R1, R2, or I.
  - Guest houses (transient)
  - Rectories, Parsonages

R4: Residential Care/Assisted Living Facilities housing six or more occupants on a 24 hour basis; these occupancies include the following:
  - Alcohol and drug abuse centers
  - Assisted living facilities
  - Congregate care facilities
  - Convalescent facilities
  - Halfway houses Group homes
  - Residential board and care facilities
  - Social rehabilitation facilities

311.3 Fire Depart Vehicle Access. All R1 and R2 occupancies three (3) or more stories in height shall provide open space at least twenty (20) feet wide along three (3) sides of the building.

SECTION 312
STORAGE OCCUPANCY-GROUP S

312.1 Scope. Group S occupancy is the principal use of a building or structure, or any portion thereof, for storage that is not classed as a Group H occupancy, including buildings or structures used for the purpose of sheltering animals. For buildings used for the storage of hazardous materials, see 308.

312.2 Subclassifications

312.2.1 S1 Moderate Hazard Storage shall include buildings used for the storage of combustible materials when not classified as S2 Low Hazard or Group H.

312.2.2 S2 Low Hazard Storage shall include buildings used for the storage of noncombustible materials such as products on wood pallets or in paper cartons without significant amounts of combustible wrappings. Such products may have a negligible amount of plastic trim such as knobs, handles, or film wrapping. S2 Low Hazard Storage shall include but not be limited to the following:
  - Beer or wine up to 12% alcohol in metal, glass or ceramic containers
  - Cement in bags,
403.3.3 There shall be posted on the outside of each projection room door and within the projection room itself a conspicuous sign with 1-inch (25.4 mm) block letters stating: SAFETY FILM ONLY PERMITTED IN THIS ROOM.

403.3.4 Every projection room shall be of permanent construction consistent with the conjunction requirements for the type of building in which the projection room is located. Openings need not be protected.

403.3.5 The room shall have a floor area of not less than 80 sq ft (7.4 m²) for a single machine, and at least 40 sq ft (3.7 m²) for each additional machine. Each motion picture projector, floodlight, spotlight or similar piece of equipment shall have a clear working space not less than 3000 inches (762x762 mm) on each side and at the rear thereof, but only one such space shall be required between two adjacent projectors.

403.3.6 The projection room and the rooms appurtenant thereto shall have a ceiling height of not less than 7 ft 6 inches (2286 mm).

403.3.7 The aggregate of openings for projection equipment shall not exceed 25% of the area of the wall between the projection room and the auditorium or assembly area. All such openings shall be provided with glass or other approved material so as to completely close the opening.

403.3.8 Projection booth ventilation shall be not less than indicated in 403.3.8.1 and 403.3.8.2.

403.3.8.1 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 may 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.

403.3.8.2 Projection booths may 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 airflow required for the lamp. 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 may also serve appurtenant rooms such as the generator room and rewind room. 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 may 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 systems or both may be combined, but shall not be interconnected with any other exhaust or return system within the building.

403.3.9 A maximum of four containers of flammable liquids not greater than 16 oz (0.473 L) capacity and of a nonbreakable type may be permitted in each projection room.

403.4 Amusement park buildings. Amusement park buildings used as dining rooms, theaters, or for other purposes shall conform to the requirements of this code governing the particular use or occupancy.

403.5 Special amusement buildings

403.5.1 Scope. Special amusement buildings shall meet all the requirements of the appropriate assembly use group in addition to the requirements of 403.5. See 403.4.

Exception: Buildings or portions thereof that are essentially open to the outside air, such as buildings without walls or without a roof and arranged to prevent the accumulation of smoke in the building or structure, need not meet the requirements of 403.5.

403.5.2 Definitions. For definitions, see Chapter 2.

403.5.3 Automatic fire detection system. An automatic fire detection system with smoke detectors shall be installed in all amusement buildings in conformance with 905.

Exception: In areas where the ambient conditions will cause a smoke detector to alarm, an approved alternate type of automatic fire detector shall be installed.

403.5.4 Sprinklers. All amusement buildings shall be provided throughout with an automatic sprinkler system in accordance with the standards listed in 903.2. When the special amusement building is temporary or mobile, the sprinkler water supply may be an approved temporary means.

Exception: An automatic sprinkler system is not required when the total floor area of a temporary special amusement building is less than 1,000 sq ft (93 m²) and the travel distance from any point is less than 50 ft (15 m).

403.5.5 System response

403.5.5.1 The activation of the automatic fire detection system within a single protected area or the automatic sprinkler system shall automatically:
1. Cause illumination of the means of egress with light of not less than 1 foot-candle (10.8 lx) at the walking surface level, and
2. Stop any conflicting or confusing sounds and visual effects, and
3. Activate an approved directional exit marking that will become apparent in an emergency.

403.5.5.2 Activation of any single smoke detector, the automatic sprinkler system or any 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 403.5.5.1(1) through 403.5.5.1(3).

403.5.5.3 A public address system installed in accordance with NFPA 72 shall be provided and shall be audible throughout the entire amusement building.

403.5.6 Exit illumination and signs. Exit illumination and signs shall meet the requirements of 1016. Where mirrors, mazes or other designs are used that confound the means of egress path, approved low level exit signs and directional path markings shall be provided and located no more than 8 inches (203 mm) above the walking surface on or near the egress path.

404.2 Automotive service station
404.2.1 An automotive service station of Group B occupancy is a place of retail business at which outdoor automotive refueling is carried on using fixed dispensing equipment connected to storage tanks by a closed system of piping and/or at which goods and services generally required in the operation and maintenance of motor vehicles and fulfilling of motorist needs may also be available. The building consists of a sales office where automotive accessories and packaged automotive supplies may be kept or displayed. It may also include one or more service bays in which vehicle washing, lubrication and minor replacement, adjustment and repair services are rendered. An automobile service station building shall not have a basement, but may have open pits if such pits are continually ventilated. It may be of any construction type.

404.2.2 Canopies and their supports over pumps shall be of noncombustible materials, wood of Type III sizes, or of construction providing 1-hour fire resistance. Combustible materials used in or on a canopy shall be:
1. Shielded from the pumps by a noncombustible element of the canopy, or wood of Type III sizes, or
2. Approved plastics covered by an aluminum facing having a minimum thickness of 0.020 inch (0.51 mm) or corrosion-resistant steel having a minimum base metal thickness of 0.016 inch (0.41 mm). The approved plastic shall have a flame spread rating of 25 or less when tested in the form intended for use in accordance with ASTM E 84.

404.2.3 Pumps or other dispensing devices shall be located a minimum of 10 ft (3048 mm) from a property line and from any building of Type VI construction. Pumps shall be located so the nozzle, with hose fully extended, shall not reach within 5 ft (1524 mm) of any building opening.

404.2.4 Pumps installed above grade shall be mounted on a concrete foundation and protected against vehicle damage by mounting on a concrete island or other approved collision protection. Subsurface pumps shall be installed in accordance with approved standards.

404.2.5 Storage and handling of flammable and combustible liquids shall be in accordance with the Standard Fire Prevention Code.

404.2.6 The pump motor shall be activated by a switch that cannot be energized until after the hose nozzle has been removed from its boot. The motor shall stop operating when the switch is de-energized upon replacement of the hose nozzle in its boot.
### TABLE 408.3.2
ALLOWABLE HEIGHTS AND BUILDING AREAS FOR HAZARDOUS PRODUCTION MATERIAL FACILITIES

(ALLOWABLE BUILDING AREA IS SHOWN IN THOUSANDS OF SQUARE FEET PER FLOOR.)

<table>
<thead>
<tr>
<th>TYPE OF CONSTRUCTION</th>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
<th>Type IV</th>
<th>Type V</th>
<th>Type V1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. No. of Stories</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Max. Height (feet)</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>Area: Multistory</td>
<td>UA</td>
<td>UA</td>
<td>63.0</td>
<td>63.0</td>
<td>42.0</td>
<td>45.0</td>
</tr>
<tr>
<td>One story only</td>
<td>UA</td>
<td>UA</td>
<td>94.5</td>
<td>94.5</td>
<td>63.0</td>
<td>67.5</td>
</tr>
</tbody>
</table>

For SI: 1 ft = 0.305 m, 1 sq ft = 0.0929 m².  UA = Unlimited Area

**Notes:**
1. The increases permitted in 5033 shall apply.
2. The provisions of 503.4.1 and Table 500 shall not apply.
3. The area limitations are based on the building facing on one street of public space not less than 30 ft wide.

### TABLE 408.3.3A
PERMITTED QUANTITIES OF HAZARDOUS PRODUCTION MATERIAL IN A SINGLE HAZARDOUS PRODUCTION MATERIAL FACILITY DENSITY BASES

<table>
<thead>
<tr>
<th>STATE</th>
<th>UNITS</th>
<th>FLAMMABLE</th>
<th>OXIDIZER</th>
<th>CORROSIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>solid</td>
<td>lbs/sq ft</td>
<td>0.001</td>
<td>0.003</td>
<td>0.003</td>
</tr>
<tr>
<td>liquid</td>
<td>gal/sq ft</td>
<td>0.042</td>
<td>0.03</td>
<td>0.08</td>
</tr>
<tr>
<td>gas</td>
<td>cf/sq ft</td>
<td>1.250</td>
<td>1.250</td>
<td>3.000</td>
</tr>
</tbody>
</table>

For SI: 1 lb/sq ft = 4.882 kg/m², 1 gal/sq ft = 40.747 L/m², 1 cf/sq ft = 0.0283 m³/m²

**Notes:**
1. Hazardous production material within piping shall not be included in the calculated amount.
2. The maximum permitted quantities of flammable and combustible liquids shall not exceed the following quantities:
   - Class (IA) + (IB) + (IC) (Combination flammable liquids) 0.025
   - however, Class IA shall not exceed 0.0025
   - Class II 0.1
   - Class IIIA 0.02
3. Highly toxic material, highly toxic and toxic gases shall be limited by the maximum quantities specified in Table 408.3.3B.

### TABLE 408.3.3B
PERMITTED QUANTITIES OF HAZARDOUS PRODUCTION MATERIAL IN A SINGLE FABRICATION AREA

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>MAXIMUM QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable liquids</td>
<td></td>
</tr>
<tr>
<td>Class IA</td>
<td>90 gal</td>
</tr>
<tr>
<td>Class IB</td>
<td>180 gal</td>
</tr>
<tr>
<td>Class IC</td>
<td>270 gal</td>
</tr>
<tr>
<td>Combination flammable liquids</td>
<td>360 gal</td>
</tr>
<tr>
<td>Flammable gases</td>
<td>9,000 cu ft at normal temperature and pressure</td>
</tr>
<tr>
<td>Liquefied flammable gases</td>
<td>180 gal</td>
</tr>
<tr>
<td>Flammable solids</td>
<td>1,500 lbs</td>
</tr>
<tr>
<td>Corrosive Liquids</td>
<td>165 gal</td>
</tr>
<tr>
<td>Oxidizing material –gases</td>
<td>18,000 Cu ft</td>
</tr>
<tr>
<td>Oxidizing material –liquids</td>
<td>150 gal</td>
</tr>
<tr>
<td>Oxidizing material-solids</td>
<td>1,500 lbs</td>
</tr>
<tr>
<td>Organic peroxides</td>
<td>30 lbs</td>
</tr>
</tbody>
</table>

**Notes:**
1. Containing not more than the exempt amounts of Class IA, IB, IC flammable liquids.
2. When the amount of hazardous material in a building is less than one-third of the maximum quantity contained in this table, 301.3 shall be used to establish the appropriate occupancy.

For SI: 1 lb = 0.4536 kg, 1 gal = 3.7854 L, 1 cu ft = 0.02832 m³.
408.3.4.2 The fire resistance of construction separating a fabrication area from an HPM cutoff room shall have a fire rating of not less than 2 hours with the openings protected by self-closing doors having a fire resistance rating of not less than 1 1/2 hours.

408.3.4.3 Floor forming part of the required separation shall be liquidtight.

408.3.5 Floors. Floors within fabrication areas shall be of noncombustible construction. Unprotected openings through the floor of fabrication areas are permitted when the interconnected levels are used solely for mechanical equipment directly related to such fabrication area.

A fabrication area may have mechanical, duct and piping penetrations, which extend through not more than two floors within that fabrication area. Penetrations shall be effectively sealed to prevent airflow at the floor level. The fabrication area, including the areas through which ductwork and piping extend, shall be considered a single conditioned space.

408.3.6 Ventilation
   408.3.6.1 General. Ventilation systems shall comply with the Standard Mechanical Code except as otherwise provided herein. Ventilation, including recirculated air, shall be provided throughout the fabrication area at the rate of not less than 1 cfm per sq ft (0.0051 m³/s/m²) of floor area.

408.3.6.2 Interconnection. The exhaust system of one fabrication area shall not connect to another exhaust system outside that fabrication area within the building. The return air system from one fabrication area shall not connect to any other system.

408.3.6.3 Smoke detectors. Smoke detectors shall be installed in the recirculating air stream and shall initiate a signal at the emergency control station.

408.3.6.4 Shutoff switches. Automatic shutoffs are not required to be installed on air-moving equipment. A manually operated remote switch to shut off the fabrication area supply or recirculating air system, or both, shall be provided at an approved location outside the fabrication area.

408.3.7 Gas detection. When HPM gas is used or dispensed and the physiological warning properties for the gas are at a higher level than the accepted permissible exposure limit for the gas, a continuous gas-monitoring system shall be provided to detect the presence of a short-term hazard condition. When dispensing occurs with the possibility of generating flammable gases or vapors in quantities exceeding 20% of the lower explosive limit, a continuous gas-monitoring system shall be provided. The monitoring system shall be connected to the emergency control station.

408.3.8 Transporting hazardous production material. HPM shall be transported to fabrication areas through enclosed piping or tubing systems that comply with 408.7 through HPM service corridors or in exit access corridors as permitted in the exception in 408.4. The handling or transporting of HPM within HPM service corridors shall comply with the Standard Fire Prevention Code.

408.3.9 Means of egress. There shall be not less than two egress doors from all portions of an HPM facility having a floor area of 200 sq ft (18.6 m²) or more regardless of the number of occupants within the room or space. All doors shall swing in the direction of egress.

408.3.10 Electrical. Electrical equipment and devices within the fabrication area shall comply with NFPA 70. The requirements for hazardous locations need not be applied when the average air change is at least 4 cfm per sq ft (0.02 m³/s/m²) of floor area and when the number of air changes at any location is not less than 3 cfm per sq ft (0.015 m³/s/m²).

408.4 Exit access corridors
   408.4.1 Exit access corridors shall be separated from fabrication areas as specified in 408.3.4. Exit access corridors shall not be used for transporting HPM except as provided herein and in 408.7.2.

   Exception: In existing HPM Facilities, when there are alterations or modifications to existing fabrication areas, the transportation of HPM in exit access corridors shall be permitted when all the following requirements are met:
   1. Corridors adjacent to the fabrication area under alteration shall comply with 408.3.4 and Table 705.1.2 for the length of the common wall of the corridor and the fabrication area, and for the distance along the exit access corridor to the point of entry of HPM into the exit access corridor serving that fabrication area.
   2. There shall be no openings between an exit access corridor and an HPM storage cabinet in a fabrication area unless 1-hour fire doors are installed between the exit access corridor and the cabinet; the cabinet is enclosed with 1-hour fire resistant construction and the cabinet is internally fire sprinklered.

408.5 HPM service corridors
   408.5.1 General. HPM service corridors shall be considered as part of the HPM Facility.

   408.5.2 Separation. HPM service corridors shall be separated from exit access corridors as required by 408.3.4.

   408.5.3 Ventilation. HPM service corridors shall be mechanically ventilated as required by 408.3.6.

   408.5.4 Means of egress. There shall be not less than two egress doors from an HPM service corridor. Not more
409.2.16 Windowless buildings

For the purpose of this section, a windowless building or portion of a building is one with nonopenable windows, windows not readily breakable, or with no windows.

909.2.16.2 Windowless buildings shall be provided with vent openings, smoke shafts, or an engineered smoke control system approved by the building official to provide ventilation, mechanical or natural, for each windowless smoke compartment.

409.2.17 Building services

409.2.17.1 Alarms, emergency communication systems and the illumination of generator set locations shall be as described for the Life Safety Branch in NFPA 70.

409.2.17.2 Portable space heating devices are prohibited. Any heating device other than a central heating plant shall be so designed and installed that combustible material will not be ignited by it or its appurtenances. If fuel-fired, such heating devices shall be chimney or vent connected, shall take air for combustion directly from outside, and shall be so designed and installed to provide for complete separation of the combustion system from the atmosphere of the occupied area. The heating system shall have safety devices to immediately stop the flow of fuel and shut down the equipment in case of either excessive temperatures or ignition failure.

Exception: Approved suspended unit heaters may be used in locations other than means of egress and sleeping areas provided such heaters are located high enough to be out of the reach of persons using the area and provided they are vent connected and equipped with the safety devices called for above.

409.2.17.3 Combustion and ventilation air for boiler, incinerator or heater rooms shall be taken directly from and discharged directly to the outside air.

409.2.17.4 Trash chutes, incinerators and laundry chutes shall comply with the provisions of NFPA 82.

1. Any trash chute or linen chute, including pneumatic rubbish and linen systems, shall be provided with automatic extinguishing protection installed in accordance with NFPA 13.

2. Any trash chute shall discharge into a trash collecting room used for no other purpose and protected in accordance with NFPA 82.

3. No incinerator shall be directly flue-fed nor shall any floor chute directly connect with the combustion chamber.

409.2.18 Emergency and standby power and light.

409.2.18.1 A permanently installed battery or standby engine driven power generation system conforming to NFPA 70 shall be provided to serve essential emergency operation. It shall be equipped to automatically start upon failure of the normal electrical service, and within 10 seconds of the loss of power to automatically transfer circuits required for essential emergency

---

**TABLE 409.2.15**

**SEPARATION REQUIRED FOR RESIDENT HOUSING AREAS**

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>USE 2</th>
<th>USE 3</th>
<th>USE 4</th>
<th>USE 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room to Room Separation</td>
<td>FR</td>
<td>FR</td>
<td>FR</td>
<td>FR</td>
</tr>
<tr>
<td>Room Face to Corridor Separation</td>
<td>ST</td>
<td>ST</td>
<td>ST</td>
<td>ST</td>
</tr>
<tr>
<td>Room Face to Common Space Separation</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Common Space to Corridor Separation</td>
<td>ST</td>
<td>ST</td>
<td>ST</td>
<td>ST</td>
</tr>
<tr>
<td>Total Openings in Solid Room Face</td>
<td>120 sq in</td>
<td>120 sq in</td>
<td>120 sq in</td>
<td>120 sq in</td>
</tr>
</tbody>
</table>

For SI: 1 in² = 645.16 MM².

Notes:

1. Doors in openings in partitions required to be fire resistant by this chart in other required enclosures of exits or hazardous areas shall be substantial doors of construction that will resist fire for at least 20 minutes. Wire glass or minimum 45-minute fire rated glazing vision panels are permitted. Latches and door closers are not required on cell doors.

2. Doors in openings in partitions required to be smoketight by the chart shall be substantial doors, of construction that will resist the passage of smoke. Latches and door closers are not required on cell doors.

3. "Total Openings in Solid Room Face" includes all openings (undercuts, food passes, grills, etc.), the total of which will not exceed 120 square inches. All openings shall be 36 inches or less above the floor.

4. Under Use Condition 2, 3, or 4, a space housing not more than 16 persons and subdivided by open construction (any combination of grating doors and grating walls or solid walls) may be considered one room. The perimeter walls of such space shall be of smoketight construction. Smoke detection shall be provided in such space. Under Use Condition 4, common walls between sleeping areas within the space shall be smoketight and grating doors and fronts may be used.

5. This is the travel distance through the common space to the exit access corridor.

FR = Fire Rated-1-hour
FR(1/2) = Fire Rated-1/2-hour
ST = Smoke tight
NS = No requirement
AS = Protected by automatic sprinklers
NR = Not protected by automatic sprinklers

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operations. The system shall have an on-premises fuel supply sufficient for at least 2 hours of continuous operation at full demand load; equipment fueled by pipeline natural gas may be utilized if acceptable to the building official. System supervision devices and a manual start feature shall be provided in facilities with 48 or more beds. Correctional facilities shall have a fuel supply sufficient for 24 hours.

409.2.18.2 The following loads are classified as essential emergency operations:
1. Emergency egress illumination in accordance with 1016.
2. Exit sign illumination.
3. All power and lighting circuits in Central Control.
4. Lighting at each staff station.
5. All required communication and alarm systems, including facility telephone lines.
6. Automatic fire detection and fire alarm systems.
7. Power for electric door operation and lock release.
8. Fire pumps where required.
9. All equipment required to provide smoke control.

409.2.18.3 Normal and standby power shall be so arranged to minimize the simultaneous interruption of power by a single act including the opening of a switch.

409.2.19 Fire access openings. Openings for fire department use in 903.5 and 1405 are not required.

SECTION 410
SPECIAL RESIDENTIAL OCCUPANCIES

410.1 General
410.1.1 Additional provisions for R3 occupancies are contained in Appendix C. Those provisions are applicable only where specifically included in the adopting ordinance.

410.1.2 Provisions for Group R high rise buildings are contained in 412.

410.2 Residential care/assisted living facilities
410.2.1 Number of occupants. Occupancies in this classification shall be divided into small facilities and large facilities based upon the number of occupants residing therein. Requirements for these occupancies shall be based upon the classification and number of occupants as prescribed in this code and the Standard Fire Prevention Code.

410.2.1.1 Small facilities. Facilities housing 16 or fewer occupants.

410.2.1.2 Large facilities. Facilities housing more than 16 occupants.

410.2.2 Protection from hazardous areas. Hazardous areas listed in Table 410.2.2 shall be protected as shown. All doors shall be self-closing or automatic closing by smoke detection. Where nonfire rated separation is permitted, the hazardous area shall be separated from the

<table>
<thead>
<tr>
<th>AREA</th>
<th>SEPARATION</th>
<th>PROTECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler and heater rooms</td>
<td>1-hour separation/ 3/4-hour doors</td>
<td></td>
</tr>
<tr>
<td>Physical plant maintenance shop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laundries greater than 100 sq ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soiled linen rooms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage rooms more than 100 sq ft</td>
<td></td>
<td>storing combustible material</td>
</tr>
<tr>
<td>storing combustible material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trash collection rooms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee locker rooms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gift/retail shop Handicraft shops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workshops Kitchens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage rooms more than 50 sq ft in area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>but not more than 100 sq ft in area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratories and paint shops employing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hazardous materials in quantities less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>than the exempt amount permitted in a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>single control area</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For SI: 1 sq ft = 0.0929 m².
remainder of the building by partitions constructed of materials consistent with the building type of construction and capable of resisting the passage of smoke. The partitions shall extend from the floor to the underside of a fire resistance rated floor/ceiling or roof/ceiling assembly or to the floor/roof deck above.

SECTION 411
SPECIAL STORAGE OCCUPANCIES

411.1 General
411.1.1 Refer to Chapter 36 of the Standard Fire Prevention Code for provisions on storage of high-piled combustible material and high-rack storage systems.

411.1.2 The storage, location, and ventilation requirements for storage batteries shall comply with NFPA -70, Article 480.

411.2 Automobile parking garages
411.2.1 Automobile parking garages shall be classified as either open, as defined in 411.3, or enclosed and shall meet the appropriate criteria of 411.3 or 411.4.

411.2.2 The clear height of each floor level in vehicle and pedestrian traffic areas shall not be less than 7 ft (2134 mm).

411.2.3 Pedestrian guardrails shall be provided in accordance with 1015 at all exterior and interior vertical openings on all floor and roof areas where automobiles are parked or moved and when the vertical distance to the ground or surface directly below exceeds 3 ft (914 mm). Such parking areas shall also be provided with exterior or interior walls or impact guardrails, except at pedestrian or vehicular accesses, designed in accordance with 1608.2.3. Impact guardrails not less than 2 ft (607 mm) high shall be placed at the ends of drive lanes, at the end of parking spaces at the perimeter of the structure and at the end of parking spaces where the difference in adjacent floor elevation is greater than 1 ft (305 mm).

411.2.4 Automobile ramps shall not be considered as providing required exit facilities. Enclosed ramps shall be in accordance with the exit requirements of Chapter 10.

411.2.5 Parking surfaces shall be of concrete or similar noncombustible and nonabsorbent materials.

Exception: Asphalt parking surfaces are permitted at ground level.

411.2.6 Automobile parking garages shall be separated from other occupancies in accordance with 704.

Exception: Separation is not required between a Group R3 building and an attached garage.

411.2.7 Connection of an automobile parking garage with any room in which there is a fuel-fired appliance shall be by means of a doorway with a raised sill at least 8 inches (203 mm) above the garage floor or through a vestibule providing two door separation.

Exception: Group R3 buildings with attached garages.

411.2.8 Openings from a parking garage directly into a room used for sleeping purposes shall not be permitted.

411.2.9 Garages of Type VI construction shall be permitted for use only for dead storage or display of automobiles.

Exception: Garages not exceeding 1200 sq ft (111.5 m²) and used for the storage of not more than four automobiles or trucks of 1 ton (907.2 kg) or less capacity.

411.3 Open parking garages
411.3.1 Open automobile parking garages with roof parking may be constructed to the allowable heights and areas specified in Table 411.3.1. To be considered open, the garage shall meet the requirements of 411.3.2, 411.3.3 and 411.3.4.

| TABLE 411.3.1 |
|OPEN AUTOMOBILE PARKING GARAGES ALLOWABLE HEIGHTS AND AREAS|

<table>
<thead>
<tr>
<th>Construction Type</th>
<th>Sq Ft Per Floor</th>
<th>Allowable Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>No Limit</td>
<td>7 Stories</td>
</tr>
<tr>
<td>Type II</td>
<td>No Limit</td>
<td>7 Stories</td>
</tr>
<tr>
<td>Type III</td>
<td>30,000</td>
<td>4 stories or 40 ft</td>
</tr>
<tr>
<td>Type IV</td>
<td>400,000</td>
<td>5 stories or 55 ft</td>
</tr>
</tbody>
</table>

For SE 1 ft = 0.305 m, 1 sq ft = 0.0929 m².

411.3.2 The exterior and interior walls of the garage shall be designed in accordance with one of the following:
1. At least 50% of the clear height between floors shall be open to the atmosphere for the full length of at least two exterior walls, excluding required stair and elevator walls and structural columns. Interior wall lines and column lines shall be at least 20% open and uniformly distributed, or
2. The exterior walls of the structure shall have uniformly distributed openings on two or more sides totaling no less than 40% of the building perimeter. The area of such openings in the exterior walls on each level shall be at least 20% of the total perimeter wall area of each level. Interior wall lines and column lines shall be at least 20% open and uniformly distributed.

411.3.3 The distance from any point on any floor level to an open exterior wall facing on a street, or to other permanently maintained open space at least 20 ft (6096 mm) wide extending full width to a street, shall not exceed 200 ft (61 m).
411.3.4 Garages within 10 ft (3048 mm.) of a common property or building line shall be provided with an enclosure wall along the line of not less than 1-hour fire resistance without openings therein, except door openings meeting the requirements of 705.1.3 shall be permitted.

411.4 Enclosed parking garages

411.4.1 Enclosed automobile parking garages and portions thereof which do not meet the definition of open parking garages shall be limited to the allowable heights and areas specified in Table 500 for Group S buildings. Roof parking is permitted.

411.4.2 A mechanical ventilation system for the removal of the products of combustion shall be provided in enclosed automobile parking garages. The mechanical system shall be capable of providing at least 6 air changes per hour for each level. Under normal use the ventilation of the enclosed automobile parking garage shall comply with the ventilation requirements of 411.5.

Exception: A mechanical ventilation system shall not be required in garages used for the storage of not more than four automobiles or trucks of 1 ton (907.2 kg) maximum capacity.

411.5 Repair garages

411.5.1 A repair garage is any building or part thereof which is used for painting, body and fender work, engine overhauling or other major repair of motor vehicles.

Exception: This occupancy shall not include automotive service stations, as defined in 404.2.

411.5.2 Garages of Type VI construction may be used only for dead storage and display of automobiles.

411.5.3 A repair garage shall not be located within, or attached to, a building occupied for any other purpose, unless separated from the other occupancies as prescribed in 704. Such separation shall be continuous and unpierced, except for doors leading to salesrooms, or offices, operated in connection with such garages, provided such openings are approved by the building official as being required or essential, and provided such openings are equipped with self-closing fire doors conforming to the requirements of 705.1.

411.5.4 Repair garages shall be continuously ventilated by a mechanical system with positive means for both inlet and exhaust of at least 0.75 cfm per sq ft (0.0038 m³/S/m²) of floor area, controlled from a location close to the entrance door.

411.5.5 Garage floors shall be of concrete or similar non-combustible and nonabsorbent materials.

411.5.6 Heating equipment, other than unit heaters suspended at least 8 ft (2438 min) above the garage floor, shall be placed in another room separated by 2-hour fire resistant construction. Entrance shall be from the outside or by means of a doorway with sill raised at least 8 inches (203 min) above the garage floor level or through a vestibule providing two doorway separations.

411.6 Parking lots. Open sheds or canopies may be erected not to exceed two-thirds the area of the lot, provided such construction is not less than that required for Type IV construction, and that all such construction meets the approval of the building official.

411.7 Aircraft hangars

411.7.1 Aircraft hangars may be of any type of construction. Exterior walls that are located within 30 ft (9144 mm) and facing common property lines or the opposite side of a public street or thoroughfare shall provide not less than 2-hour fire resistance.

411.7.2 The floor areas of hangars shall not exceed those permitted for Group S in Table 500 as modified.

411.7.3 Where hangars have basements, the floor over the basement shall be of Type I construction and shall be made tight against seepage of water, oil or vapors. There shall be no opening or communication between basement and hangar. Access to basement shall be from outside only.

411.7.4 Floors shall be graded and drained to prevent water or gasoline from remaining on the floor. Floor drains shall discharge through an oil separator to the sewer or to an outside vented sump.

411.7.5 Heating equipment other than unit heaters suspended at least 10 ft (3048 mm) above the upper surface of wings or engine enclosures of the highest aircraft which may be housed in the hangar and at least 8 ft (2438 mm) above the floor in shops, offices, and other sections of the hangar communicating with storage or service areas shall be placed in a separate room cut off by 2-hour fire resistant construction. Entrance shall be from the outside or by means of a doorway with a sill raised at least 8 inches (203 mm) above the hangar floor level or through a vestibule providing two door separation.

411.7.6 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 sprinkler equipment in accordance with 903.

411.7.7 Aircraft hangars shall be provided with fire suppression as required in NFPA 409.

Exception: Group II hangars storing private aircraft without major maintenance or overhaul are exempt from foam suppression requirements.
411.7.8 Residential aircraft hangars.

411.7.8.1 Residential aircraft hangars as defined in 411.7.8.2 shall comply with 411.7.8.3 through 411.7.8.7.

411.7.8.2 Definitions. For definitions, see Chapter 2.

411.7.8.3 A hangar may be attached to a dwelling when separated by walls having a fire resistance rating of not less than 1 hour. Such separation shall be continuous from foundation to the underside of the roof and un-pierced except for doors leading to the dwelling unit. All doors into the dwelling unit must be equipped with self-closing devices and conform to the requirements of 705.1 with at least a 4-inch (102 mm) noncombustible raised sill.

411.7.8.4 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.

411.7.8.5 At least one approved smoke detector shall be installed within the hangar and shall be hardwired into the residential smoke alarm or other sounding device to provide an alarm which will be audible in all sleeping areas of the dwelling.

411.7.8.6 All mechanical and DWV systems installed within the hangar shall be independent of the systems installed within the dwelling. Building sewer lines may connect outside the structures.

Exception: Smoke detector wiring and feed for electrical subpanels in the hangar.

411.7.8.7 Hangars shall not exceed 2,000 sq ft (185.8 m²) in area and 20 ft (6096 mm) in height.

411.8 Helistops

411.8.1 Helistops may be erected on buildings or other locations when they are constructed in accordance with this section.

411.8.2 Helistops shall be erected in accordance with 411.8 and NFPA 418.

411.8.3 The touchdown or landing area for helicopters of less than 3,500 lb (1588 kg) shall be a minimum of 20 ft (6096 mm) in length and width. The touchdown area shall be surrounded on all sides by a clear area having a minimum average width at roof level of 15 ft (4572 mm) but with no width less than 5 ft (1524 mm).

411.8.4 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 provision 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.

411.8.5 For means of egress requirements for helistops see 1027.1.2.

411.9 Coal pockets. Coal pockets, and other similar structures, shall be constructed of steel, concrete, or other noncombustible material, or of lumber sizes, which meet the requirements of Type III construction.

411.10 Greenhouses

411.10.1 Greenhouses constructed totally of noncombustible materials and used exclusively for the cultivation of live plants may be unlimited in area.

411.10.2 Greenhouses more than 35 ft (10.7 m) high shall have a noncombustible structural frame. Greenhouses not over 400 sq ft (37.2 m²) in area and not over 15 ft (4572 mm) high shall be considered accessory structures and may be of any construction, except that a greenhouse with wood frame construction shall be located not less than 5 ft (1524 mm) from an adjoining structure or property line.

411.10.3 Refer to Table 1610.1 for deflection limits.

411.10.4 Greenhouses used exclusively for the cultivation of live plants and with no access to the general public shall be considered to represent a low hazard to human life for purposes of establishing the importance factor, 1, in ASCE 7, Section 7, and the use factor in Table 1606.

411.11 Farm buildings. Farm buildings shall include those structures, other than residences and structures appurtenant thereto, for on-farm use (barns, sheds, poultry houses, etc.). Refer to Table 1610.1 for deflection limits.

SECTION 412
SPECIAL PROVISIONS FOR GROUP B AND GROUP R HIGH RISE BUILDINGS

412.1 Scope

412.1.1 These requirements shall apply to all Group B and Group R buildings having floor surfaces used for human occupancy located more than 55 ft (16.78m) above the lowest level of fire department vehicle access.

Group R buildings shall be provided with an approved automatic sprinkler system in accordance with 412.10. Group B buildings more than 5 stories or 55 ft (16.78m) high shall be provided with an approved automatic sprinkler system in accordance with 412.10.

412.1.2 All mechanical and electrical systems shall be approved and installed in accordance with approved plans and specifications pursuant to this section and shall be tested and proved to be in proper working condition to the satisfaction of the building official before issuance of the certificate of occupancy.

412.1.3 See also 1005.6 for smokeproof enclosures.
412.2 Automatic fire detection systems
412.2.1 At least one approved smoke detector suitable for the intended use shall be installed in:
1. Every mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar room.
2. In every elevator lobby.
3. All recirculating air systems serving more than one story. The detector shall be accessible and shall be located in the return airstream prior to any exhausting from the building or mixing with the fresh air makeup.
4. Each connection to a return air vertical duct or riser serving a recirculating air system of more than one story. In Group R occupancies, an approved smoke detector may be used in each return air riser carrying not more than 5,000 cfm (2.36 M³/s) and serving not more than 10 air inlet openings.
5. See 905.2 for additional smoke detection requirements in Group R buildings.

412.2.2 The actuation of any detector required by 412.2 shall activate the voice alarm system and shall place into operation all equipment necessary to prevent the recirculation of smoke.

412.3 Alarm and communication systems
412.3.1 A one-way voice alarm system and a two-way fire department communication system installed in accordance with NFPA 72 shall be provided.

412.3.2 Voice alarm system
412.3.2.1 The operation of any smoke detector required by 412.2, sprinkler waterflow device or manual fire alarm box shall automatically activate the voice alarm system.

412.3.2.2 Activation of the voice alarm system shall automatically sound an alert signal to the desired areas followed by voice instructions giving appropriate information.

412.3.2.3 The voice alarm system shall be designed to be clearly heard by all occupants of the building. It shall be established on a selective or general basis to the following terminal areas:
1. Elevators.
2. Elevator lobbies.
3. Corridors.
4. Exit stairways.
5. Rooms and tenant spaces exceeding 1,000 sq ft (92.9 m²) in area.
6. Dwelling units in apartment houses.
7. Hotel guest rooms or suites.

412.3.3 Fire department communication system. A two-way fire department communication system shall be provided for fire department use. It shall operate between the fire command station and every elevator, elevator lobby, entry to every enclosed exit stairway and in corridors.

412.3.4 Combined system. When approved, the fire department communications system may be combined with the voice alarm signaling system.

412.4 Fire command station
412.4.1 A fire command station for fire department operations shall be provided in a location approved by the fire department.

412.4.1 Definitions. For definitions, see Chapter 2.

412.4.2 A fire command station shall contain:
1. Controls for the one-way voice alarm system.
2. Controls for the two-way fire department communication system.
3. Fire alarm system annunciator panels.
4. Status indicators showing location of elevators in the hoistways and switches to selectively turn on or off power to elevators.
5. Status indicators and controls for air handling systems.
6. Controls for unlocking all stairway doors simultaneously.
7. Sprinkler valve, waterflow detector and fire pump display panels.
8. Emergency power, light and emergency system controls and status indicators.
9. A telephone for fire department use with controlled access to the public telephone system.
10. Generator supervision devices, manual start and transfer features.

412.5 Smoke control. Natural or mechanical ventilation for the removal of products of combustion shall be provided in every story and shall consist of one of the following:
1. Panels or windows in the exterior walls which can be opened remotely from an approved location other than the fire floor. Such venting facilities shall be provided at the rate of 20 sq ft per 50 linear ft (1.86 m² per 15 m) of exterior wall in each story and shall be distributed around the perimeter at not more than 50 ft (15 m) intervals. Such windows or panels and their controls shall be clearly identified.
2. In a building which is equipped with an approved complete automatic sprinkler system, windows or panels manually openable from the fire floor or panels of approved, fixed, fully tempered glass may be substituted for the remotely operated openable panels or windows. Such manually openable windows or fixed tempered panels shall be clearly identified and shall be of the size and spacing required in 412.5(1).
3. In a building which is equipped with an approved complete automatic sprinkler system, properly designed mechanical air handling equipment may be substituted for the natural ventilation described in 412.3(1) and 412.5(2), provided that the air handling equipment is connected to the standby power and light system. (See 412.7.2). Under fire conditions, the return and exhaust air shall be moved directly to the outside without recirculation to other sections of the building. The air han-
The building system shall have the capability of providing a minimum of one exhaust air change every 10 minutes for any area which might be involved.

4. Any other design, which will produce equivalent results, may be considered by the building official.

412.6 Elevators and elevator lobbies

412.6.1 All elevators on all floors shall open into elevator lobbies which are separated from the remainder of the building by 1-hour fire resistant construction with 20 minute opening protectives.

Exceptions:
1. Elevator lobbies within an atrium.
2. Where there are open exterior corridors the entire width of the building with stairs located at each end and the elevators are located on the exterior of the building.
3. The main entrance level of the building.

412.6.2 Openings in the elevator lobby shall be limited to those required for access to the elevators and for egress from the building. All rooms and enclosures shall have at least one required exit accessible without travel through the elevator lobby. Openings may be provided with horizontal sliding doors conforming with 1012.4. Exit stairways, chutes, janitor closets, guest rooms, service rooms, etc., shall not open into the elevator lobby.

412.6.3 Each elevator lobby shall be provided with an approved smoke detector located on the lobby ceiling. When the detector is activated, elevator doors shall not open and all cars serving that lobby are to return to the main floor and be under manual control only. If the main floor detector or a transfer floor detector is activated, all cars serving the main floor or transfer floor shall return to a location approved by the fire department and building official and be under manual control only. The detector may serve to close the lobby doors.

412.6.4 Refer to Chapter 30 for general elevator requirements.

412.7 Standby power and light

412.7.1 On-site generated power

412.7.1.1 A permanently installed standby power generation system conforming to NFPA 70 shall be provided. The system shall be equipped with suitable means for automatically starting the generator set upon failure of the normal electrical service and for automatic transfer and operation of electrical functions. System supervision devices with manual start and transfer features shall be provided at the central control station.

412.7.1.2 An on-premises fuel supply sufficient for not less than 2 hours full demand operation of the system shall be provided. All power, lighting, signal, and communication facilities provided under the requirements of this section shall be transferable to the standby power system.

412.7.2 Standby power loads. The following loads are classified as standby power loads. The transition time from the instant of failure of the normal power source to the generator source shall not exceed 60 seconds. The standby power load shall be sized to supply the following:
1. The elevator required by 3003.4.
2. Mechanical air handling systems required to be operating during an emergency.
3. Fire pumps.

412.7.3 Emergency power loads. The transition time from the instant failure of the normal power source to the generating source shall not exceed 10 seconds. The following loads are classified as emergency power loads:
1. One-way voice alarm systems.
2. Two-way fire department communication system.
3. Fire alarm systems.
4. Automatic fire detection systems.
5. Elevator car lighting.

412.8 Exits

412.8.1 All stairway doors which are to be locked from the stairway side shall have the capability of being unlocked simultaneously without unlatching upon a signal from the central control station. The doors shall be similarly unlocked upon actuation of the sprinkler system or upon power failure.

412.8.2 Telephone or other two-way communications systems connected to an approved emergency service which operates continuously shall be provided at not less than every third floor in each required stairway where other provisions of this code permit the doors to be locked.

412.9 Areas of refuge (compartmentation) alternate

412.9.1 Group R buildings more than 5 stories high with corridors exceeding 200 ft in length must be divided into a minimum of two (2) compartments. Each compartment shall not exceed 175 ft.

412.9.2 Where openings in an exterior wall are above and within 5 ft (1524 mm) laterally of an opening of the story below, such openings shall be separated by an approved flame barrier extending 30 inches (762 mm) beyond the exterior wall in the plane of the floor or by approved vertical flame barriers not less than 3 ft (914 mm) in height measured vertically above the top of the lower opening. Such flame barriers are not required when a complete automatic sprinkler system is installed.
412.9.3 Walls used for compartmenting a building shall have a fire resistance rating of not less than 2 hours. Duct penetrations of this wall shall not be permitted. Piping and conduit may penetrate or pass through the wall only if the openings are caulked with impervious noncombustible materials sufficiently tight to prevent the transfer of smoke or combustion gases from one side of the wall to the other and are so maintained. The fire door serving as the horizontal exit between compartments shall be so installed, fitted and gasketed that it will provide a substantial barrier to the passage of smoke.

412.9.4 The fire resistance of the floor or the floor/ceiling assembly shall extend to and be tight against the exterior wall so that the fire resistance integrity is maintained. Penetrations or other installations which will impair the fire resistance of the floor or floor/ceiling assembly are not permitted.

412.9.5 Manual fire alarm boxes shall be provided.

412.9.6 Each area of refuge (compartment) shall contain a minimum of one enclosed exitway stairway and each compartment shall have access to an elevator which may serve additional compartments. When elevators are directly accessible to more than one compartment, the elevator lobby shall be separated from the compartments by not less than 2-hour fire resistance rated construction with tight fitting opening protectives having fire resistance ratings of not less than 1 1/2 hours.

412.10 Automatic sprinklers alternate

412.10.1 An approved complete automatic sprinkler system shall be provided throughout the building. The sprinkler system shall be designed using the parameters set forth in NFPA 13 and 412.10.2 through 412.10.4.

412.10.2 Shutoff valves and water flow devices shall be provided at the riser connection on each floor. The actuation of a water flow device shall activate the voice alarm system. The valves shall be supervised in accordance with 903.8. The sprinkler riser may be combined with the fire department standpipe riser.

412.10.3 On-site supply of water equal to the hydraulically calculated sprinkler demand or standpipe whichever is greater shall be provided for a minimum duration of 45 minutes.

412.10.4 Automatic fire sprinklers may be omitted in the following rooms or areas when such rooms fire or areas are protected with other approved fire suppression system, which will respond to visible or invisible particles of combustion:

1. Generator and transformer rooms.
2. Any room where the application of water, or flame and water, may constitute a serious life or fire hazard.
3. 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 fire alarm system and are separated from the remainder of the building by a wall with a fire resistance rating of not less than 1 hour and a floor/ceiling assembly with a fire resistance rating of not less than 2 hours.
4. When approved by the building official, any other area or room where sprinklers are considered undesirable because of the nature of the contents.

412.11 Alternates permitted. When a complete approved automatic sprinkler system complying with 412.10 is provided, the following modifications of code requirements are acceptable:

1. Fixed tempered glass may be used in lieu of openable panels for smoke control purposes.
2. Manual fire alarm boxes are not required.
3. Spandrel walls, eyebrows and compartmentation are not required; however, the fire resistance of the floors and juncture of exterior walls with each floor must be maintained.
4. Fire dampers, other than those needed to maintain the fire resistance of the floor/ceiling assemblies, are not required except for those which may be necessary to bypass smoke to the outside, to convert from recirculated air to 100% outside air, and that which may be required to protect the fresh air supply intake against smoke which may be outside the building.
5. Smokeproof enclosures may be omitted provided all required stairways are equipped with a dampered relief opening or an exhaust fan at the top and supplied mechanically with sufficient air to discharge a minimum of 2,500 cfm (1.18 m³/s) through the relief opening while maintaining a minimum positive pressure of 0.05 inch of water column (12.4 Pa) relative to atmospheric pressure in addition to the maximum anticipated stack pressure relative to other parts of the building measured with all the enclosure doors closed. The combined positive pressure shall not exceed 0.35 inch of water column (87.1 Pa). Activation of the mechanical equipment shall be in accordance with 1005.6.9.10. The stair pressurization system shall comply with 1005.6.9.1 and 1005.6.9.2.
6. The required fire resistance rating of vertical shafts other than stairway enclosures and elevator hoistways in buildings no higher than 250 ft (76.2 m) may be reduced to 1 hour when sprinklers are installed within the shaft at alternate floors.
7. In Type I construction the fire resistance of partitions, columns, trusses, girders, beams and floors may be reduced by 1 hour, but no component or assembly shall be less than 1 hour.
CHAPTER 5
GENERAL BUILDING LIMITATIONS

SECTION 501
GENERAL

501.1 Scope. Provisions of this chapter shall govern the height and area of buildings.

SECTION 502
DEFINITIONS

For definitions, see Chapter 2.

SECTION 503
HEIGHT AND AREA

503.1 Application

503.1.1 For the purpose of this code, "height" and "area," as applied to a building, has the meaning designated in Chapter 2.

503.1.2 The height and area for buildings or structures of the different types of construction shall be governed by the intended occupancy or use of the building, as provided for in this chapter and shall not exceed the limits set forth in Table 500 except as modified in 503.2 and 503.3 and the specific use provisions of this chapter. For the purpose of this code, each part of a building or structure included within fire walls shall be considered a separate building.

Exception: A building permitted to be unlimited in area by 503.4.1 shall be permitted to have interior fire walls.

503.1.3 A building heretofore erected shall not be extended to exceed the allowable floor area set forth in this chapter, governed by the occupancy and type of construction. A building heretofore lawfully erected, which exceeds such area, may be extended horizontally, provided such extension does not exceed the area prescribed and provided such extension is separated from the existing building by a fire wall as set forth in 503.1.2.

503.2 Height modifications

503.2.1 Rooftop structures. Church spires, chimneys, tanks and supports, aerial supports, parapet walls not over 4 ft (1219 mm) high, bulkheads and penthouses used solely to enclose stairways, tanks, elevator machinery or shafts, or ventilation or air conditioning apparatus, need not be considered in determining the highest point of the building, provided that the highest point shall be taken to be the highest point of the roof of the highest penthouse when the aggregate area of all penthouses and other roof structures exceeds one-third of the area of the roof upon which they stand. See 1511.

503.2.2 Parking under Group R. Where a one-story automobile parking garage, enclosed or open of Type I or II construction, or open of Type III construction, with grade entrance, is provided under a building of Group R occupancy, the number of stories to be used in determining the minimum type of construction may be measured from the floor above such parking area. The floor/ceiling assembly between the parking garage and the Group R occupancy 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 occupancy separation required in 704.1.1.

503.2.3 Mezzanines. A mezzanine shall not be counted as a story when it meets the following requirements:

503.2.3.1 The construction of a mezzanine shall be consistent with the type of materials and fire resistance ratings required for the building in which it is constructed.

503.2.3.2 The total area of mezzanines within a room shall not exceed one-third that of the room or space in which they are located. Enclosed space under a mezzanine shall not be included in a determination of the size of the room or space in which the mezzanine is located.

503.2.3.3 All portions of a mezzanine shall be open and unobstructed to the room in which it is located except for walls not more than 42 inches (1067 mm) high, columns and posts.

Exceptions:
1. Mezzanines or portions thereof need not be open to the room in which they are located, provided the occupant load of the aggregate area of the enclosed space does not exceed 10.
2. In sprinklered buildings, a mezzanine having two or more means of egress need not open into the room in which it is located, if at least one of the means of egress provides direct access to an exit at the mezzanine level.

503.2.3.4 Means of egress shall be in accordance with 1005.7.

503.2.4 Basements. A basement of a building shall not count as a story, when applying Table 500 for allowable building height, if the upper surface of the first floor above such basement complies with all of the following:
1. is less than 7 ft (2134 mm) above grade,
2. is less than 7 ft (2134 mm) above finished ground level for more than 50 percent of the perimeter of a building, and
3. is less than 12 ft (3658 mm) above finished ground level around the entire building perimeter.

A basement is counted as a story when applying other sections of the code.

503.2.5 Group A and E basements. Group A and Group E basements used as classrooms or assembly rooms shall be counted as a story.

503.3 General area modifications;
503.3.1 The exceptions and requirements of 503.3 and 503.4 shall modify unsprinklered areas permitted by Table 500 and the specific use provisions of this chapter.

503.3.2 Where streets or public spaces, or horizontal separation from property lines of total width of not less than 30 ft (9144 mm), or 30 ft (9144 mm) between buildings on commonly owned property, extend along the building perimeter, except for hazardous occupancies, the areas permitted by Table 500 may be increased as follows:

\[ I = \frac{4}{3}[100 \left(\frac{F}{P} - 0.25\right)] \]

Where

- \( I \) = Percent increase of unsprinklered areas in Table 500
- \( F \) = Building perimeter which fronts on streets, public spaces or horizontal separation not less than 30 ft (9144 mm) wide
- \( P \) = Total perimeter of building

503.3.3 For a sprinklered building, the percent increase is multiplied by the unsprinklered area permitted in Table 500 for the type of construction of the building, and the resulting area increase is added to the sprinklered areas in Table 500. When there are no unsprinklered areas permitted for the building in Table 500, an unsprinklered area can be computed for use in this section. The corresponding unsprinklered areas are computed as one-third of the sprinklered area for one story only and as one-half of the sprinklered area for multistories.

503.4 Occupancy area modifications
503.4.1 The area of a one story building of Group B, Group F, Group M, or Group S occupancy shall not be limited provided the building is equipped with an approved automatic sprinkler system throughout, in accordance with 903, or other automatic extinguishing systems as approved by the building official, and is surrounded on all sides by a permanent open space of not less than 60 ft (18 m). High-piled combustible storage shall be protected in accordance with Chapter 36 of the Standard Fire Prevention Code.

Exceptions:
1. Where water may cause or increase a fire, other fire extinguishing systems shall be required in rooms or buildings used for the manufacture or storage of hazardous materials including but not limited to, aluminum powder, calcium carbide, metallic sodium and potassium, quicklime, magnesium powder and sodium peroxide.
2. In Group F and Group S occupancies where non-combustible products are manufactured or stored, such as metal processing and manufacturing plants, and metal products are not stored in combustible wrappings, containers or palletized, the sprinkler system may be omitted upon approval of the building official.

503.4.2 The area of a one-story building of Type IV construction used for Group E occupancy shall not be limited provided the building is equipped throughout with an approved automatic sprinkler system in accordance with 903, is surrounded on all sides by a permanent open space of not less than 60 ft (18.3 m), and is provided with 1-hour fire resistant smokestop partitions dividing the building into areas not to exceed 50,000 sq ft (2787 m²) in floor area.

503.4.3 One-story Group A buildings without a stage requiring proscenium opening protection of Type V I hour, IV or III construction which are surrounded on all sides by a permanent open space of not less than 60 ft (18.2 m), are provided with an approved automatic sprinkler system, and the assembly floor is located at, or within 21 inches (533 mm) of street or grade level and all exits meet the street or grade level by ramps having a slope not exceeding 1:12 shall not be limited in area.

503.4.4 Where there are no balconies or galleries in Group A - Large Assemblies without a stage requiring proscenium opening protection or in Group A - Small Assembly with or without a stage requiring proscenium opening protection, and the assembly floor is located at or within 21 inches (533 mm) of street or grade level and all exits meet the street or grade level by ramps having a slope not exceeding 1:12, the maximum allowable areas of Type III, IV and V construction may be increased 50% over the unsprinklered areas specified in Table 500. This increase may be added to the area increase permitted by 503.3.2.
503.4.5 One-story buildings used for participation sports such as tennis, skating and similar activities, limited in occupant content to those participating in the sports activity, and with no spectator seating permitted, may be unlimited in area when of Types III, IV and V construction and are surrounded on all sides by not less than 30 ft (9144 mm) of permanent open space.

**Exception:** Fire resistance separation shall not be required between a dwelling and its detached private garage.

503.4.6 When used as a place of worship, the allowable areas for Group A - Small Assembly without a stage requiring proscenium opening protection may be increased 33 1/3% over the unsprinklered areas specified in Table 500. This increase may be added to the area increase permitted by 503.3.2.

503.4.7 The area of a one story Group E Type III, IV or V building may be increased 100% over the unsprinklered areas specified in Table 500 if the building is surrounded on all sides by a permanent open space of not less than 60 ft (18.3 m), and there are not less than two exits provided from each classroom, one of which opens directly to the exterior of the building. This increase may be added to the area increase permitted by 503.3.2.

503.4.8 The permanent open space of 60 ft (18.3 m) required in 503.4.1, 503.4.2, 503.4.3 and 503.4.7 shall be permitted to be reduced to not less than 40 ft (12.2 m) provided all of the following requirements are met:
1. The reduced open space shall not be allowed for more than 75% of the perimeter of the building.
2. The exterior wall facing the reduced open space shall have minimum fire resistance rating of 3 hours.
3. All openings in the exterior wall, facing the reduced open space, shall have opening protectives with a fire resistance rating of 3 hours.

503A.9 Group A area modification: Open air grandstands and bleachers, see 403.6.2.1.

503.4.10 Group M area modifications: covered mail buildings see 413.6.

503.4.11 Group S area modifications:
1. Aircraft hangars see 411.7.2.
2. Automobile parking garages see 411.3.

**SECTION 504**

**BUILDINGS LOCATED ON THE SAME LOT**

Where the exterior walls of two or more buildings located on the same lot face one another, and one of the walls is not constructed as required for a fire wall, a property line shall be assumed between them. The fire resistance requirements for such facing walls and for the protection of openings therein shall be the same as required by this code for walls and openings facing an assumed property line, as provided in Table 600.
### TABLE 500
ALLOWABLE HEIGHTS AND BUILDING AREAS

Lower case letters in table refer to Notes following table.
Height for types of construction is limited to the number of stories and height in feet shown.
Allowable building area (determined by definition of "Area, Building") is shown in thousands of sq ft per floor.

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</table>

For SI: 1ft = 0.305 m, 1sq ft = 0.0929 m²

Notes:

a. For height modifications and limitations by occupancy, see:
   1. Mezzanines
   2. Basements
   3. Assembly Basements
   4. Business
   5. Educational Basements
   6. Mercantile
   7. Residential

b. For area modifications and limitations by occupancy see:
   1. Area increase for separation (All occupancies except H)
   2. Assembly
   3. Business
   4. Educational
   5. Factory-industrial
   6. Mercantile
   7. Storage

c. Modifications in height and area shall not be permitted in Group H occupancies.
d. See 903.7.5 and 903.7.6 for height limitations of unsprinklered R1 and R2 occupancies. Height and area increases in 503.2 are not permitted for NFIPA 13R sprinkler systems installed as an option in 903.7.6.
e. See 411.3.1 for allowable height and floor areas of Open Automobile Parking Structures.
f. Total area for unsprinklered Group M occupancies after increase permitted by 503.3 shall not exceed 15,000 sq. ft.
g. Height in feet not applicable to Group S and Group F occupancies.
h. When all portions of buildings are sprinklered in accordance with the standards listed in 903.2, the height of buildings listed under this column may be increased one story. A general area increase provided for in 503.3.2 may be applied before using footnote h. (Also, see note j.)
i. Automatic sprinkler protection required throughout all buildings where Use Condition 5 is used. See 409.2.3. and 1024.2.2.
j. When all portions of buildings are sprinklered in accordance with the standards listed in 903.2, the allowable heights and areas of buildings shall be as listed under this column. (Also, see note h.)
CHAPTER 6
CONSTRUCTION TYPES

SECTION 601
GENERAL

601.1 Scope. Provisions of this chapter shall govern the classification of construction type by materials and fire resistance of its elements and the use of more than one construction type in a building.

601.2 Classification by type of construction

601.2.1 Every building shall be classified by the building official into one of the types of construction as set forth in this section.

| Type I | Type V  
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Type II</td>
<td>1-Hour Protected</td>
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<tr>
<td>Type III</td>
<td>Unprotected</td>
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<td>Type IV</td>
<td>Type V I</td>
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<td>1 - Hour protected</td>
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<tr>
<td>Unprotected</td>
<td>Unprotected</td>
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601.2.2 Materials for any one of the six types of construction may be used as specified in Table 600, or as permitted in this chapter. Timber trusses are not allowed on Type I and II buildings above 65 feet.

601.3 Fire resistance requirements

601.3.1 All fire resistance requirements are expressed in terms of the number of hours of Satisfactory performance in accordance with ASTM F 119.

601.3.2 Construction required to have a fire resistance rating shall be supported by construction of equal or greater fire resistance.

Exception: In Type IV protected, V Unprotected and VI Unprotected construction, structural elements supporting exit corridor and tenant separation walls of not more than 1 hour fire resistance need not be rated provided a fire resistance rating, is not required by other provisions of this code.

601.4 Materials and construction approved for fire resistance

601.4.1 The degree of fire resistance and the materials, assemblies, and construction providing such resistance shall be defined in Chapter 7 of this code, except that other materials, assemblies, and construction shall be approved, provided test data of a recognized engineering or testing laboratory are submitted, establishing that they develop the required fire resistance rating under tests made in accordance with ASTM E 119 or based on calculations and accepted engineering practice as set forth in 709.

601.4.2 Where structural requirements necessitate assemblies providing greater fire resistance than specified in this chapter, such structural requirements shall govern.

SECTION 602
DEFINITIONS

For definitions, see Chapter 2.

SECTION 603
TYPE I CONSTRUCTION

Type I is construction in which the structural members including exterior walls, interior bearing walls, columns, beams, girders, trusses, arches, floors, and roofs are of noncombustible materials and are protected so as to have fire resistance not less than that specified for the structural elements as specified in Table 600. For interior nonbearing partition requirements, see 704.2. For provisions governing combustibles in concealed spaces, see 707.

SECTION 604
TYPE II CONSTRUCTION

Type II is construction in which the structural members including exterior walls, interior bearing walls, columns, beams, girders, trusses, arches, floors and roofs are of noncombustible materials and are protected so as to have fire resistance not less than that specified for the structural elements as specified in Table 600. For interior noncombustible, partition requirements see 704.2. For provisions governing combustibles in concealed spaces, see 707.

SECTION 605
TYPE III CONSTRUCTION

605.1 General. Type III is construction in which fire resistance is attained by the sizes of heavy timber members (sawn or glued laminated) being not less than indicated in this section, or by providing fire resistance not less than 1 hour where materials other than wood of heavy timber sizes are used; by the avoidance of concealed spaces under floors and roofs by the use of approved fastenings, construction details and adhesives for structural members; and by providing the required degree of fire resistance in exterior and interior walls.

605.2 Columns

605.2.1 Wood columns, may be sawn or glued laminated and shall be not than 8 inches nominal in any, dimensions when supporting floor loads, and not less than 6 inches nominal wide and 8 inches nominal deep when supporting roof and ceiling load only.

605.1.2 Columns shall be continuous or superimposed throughout all stories by means of reinforced concrete or metal caps with brackets, or shall be connected by properly designed steel or iron caps, with pintles and base plates, or by timber splice plates affixed to the columns by means of metal connectors housed within the contact faces, or by other approved methods.

605.3 Floor framing
605.3.1 Beams and girders of wood may be sawn or glued laminated and shall be not less than 6 inches nominal wide and not less than 10 inches nominal deep.

605.3.2 Framed or glued laminated arches which spring from the floor line and support floor loads shall be not less than 8 inches nominal in any dimension.

605.3.3 Framed timber trusses supporting floor loads shall have members of not less than 8 inches nominal in any dimension.

605.4 Roof framing
605.4.1 Framed or glued laminated arches for roof construction which spring from the floor line and do not support floor loads shall have members not less than 6 inches nominal wide and 8 inches nominal deep for the lower of the height and not less than 6 inches nominal in any dimension for the upper half of the height.

605.4.2 Framed or glued laminated arches for roof construction which spring from the top of walls or wall abutments, framed timber trusses and other roof framing which do not support floor loads, shall have members not less than 4 inches nominal wide and not less than 6 inches nominal deep. Spaced members may be composed of two or more pieces not less than 3 inches nominal thick when blocked solidly throughout their intervening spaces or when such spaces are tightly closed by a continuous wood cover plate of not less than 2 inches nominal thick, secured to the underside of the members. Splice plates shall be no less than 3 inches nominal thick. When protected by approved automatic sprinklers under the roof deck, such framing members shall be not less than 3 inches nominal wide.

605.5 Construction details
605.5.1 Wall plate boxes of self-releasing type, or approved hangers, shall be provided where beams and girders enter masonry. An air space of 1/2 inch (12.7 mm) shall be provided at the top, ends and sides of the member unless approved naturally durable or preservative-treated wood is used.

605.5.2 Girders and beams shall be closely fitted around columns and adjoining ends shall be cross-tied to each other, or inter-tied by caps or ties, to transfer horizontal roads across the joint. Wood bolsters may be placed on tops of columns which support roof loads only.

605.5.3 Where intermediate beams are used to support floors, they shall rest on top of the girders, or shall be sup-ported by ledgers or blocks securely fastened to the sides of the girders, or they may be supported by approved metal hangers into which the ends of the beams shall be fitted closely.

605.5.4 Columns, beams, girders, arches and trusses of material other than wood shall have a fire resistance rating of not less than 1 hour.

605.5.5 Wood beams and girders supported by walls required to have a fire resistance rating of 2 hours or more shall have not less than 4 inches (102 mm) of solid masonry between their ends and the outside face of the wall, and between adjacent beams.

605.5.6 Adequate roof anchorage shall be provided.

605.6 Floor decks. Floors shall be without concealed spaces. They shall be of sawn or glued laminated plank, splined, or tongue-and-grooved, not less than 3 inches nominal thick, or of planks not less than 4 inches nominal wide set on edge and well-spiked together. The planks shall be laid so that no continuous line of joints will occur except at points of support and they shall not be spiked to supporting girders. Planks shall be covered with 1 inch nominal tongue-and-groove flooring laid crosswise or diagonally or with 15/32 inch (11.9 mm) wood structural panels. Planks and flooring shall not extend closer than 1/2 inch (12.7 mm) to walls to provide an expansion joint, and the joint shall be covered at top or bottom.

605.7 Roof decks. Roofs shall be without concealed spaces and roof decks shall be sawn or glued laminated, splined or tongue and grooved plank, not less than 2 inches nominal thick, or of planks not less than 3 inches nominal wide, set on edge and spiked together as required for floors, or of 1 1/8 inch (29 mm) tongue and grooved wood structural panels bonded with exterior glue. Other types of decking may be used when approved by the building official.

605.8 Walls
605.8.1 Bearing portions of exterior and interior walls shall be of approved noncombustible materials and shall provide fire resistance ratings in accordance with Table 600.

605.8.2 Nonbearing portions of exterior walls shall be of approved noncombustible materials and shall provide fire resistance ratings in accordance with Table 600.

Exception: Where a horizontal separation of at least 20 ft (6096 mm) is provided, wood columns, arches, beams and roof decks conforming to heavy timber sizes may be used externally.

SECTION 606
TYPE IV CONSTRUCTION
Type IV is construction in which the structural members including exterior walls, interior bearing walls, columns, beams, girders, trusses, arches, floors, and roofs are of non-
CHAPTER 8
INTERIOR FINISHES

SECTION 801
GENERAL

801.1 Scope. Provisions of this chapter shall govern the use of materials as interior finishes by limiting the allowable flamespread and smoke development based on location and occupancy classification.

SECTION 802
DEFINITIONS

For definitions, see Chapter 2.

SECTION 803
RESTRICTIONS ON INTERIOR FINISHES

803.1 General

803.1.1 Combustible materials may be used as a finish for ceilings, floors and other interior surfaces of buildings as provided in this section. Show windows in the first story of buildings may be of wood or of unprotected metal framing.

803.1.2 Interior finish shall mean the exposed interior surfaces of buildings including, but not limited to, fixed or movable walls and partitions, columns, and ceilings, interior wainscoting, paneling or other finish applied structurally or for decoration, acoustical correction, surface insulation, structural fire resistance or similar purposes. Requirements for finishes shall not apply to trim, defined as picture molds, chair rails, baseboards, and handrails; to doors and windows or their frames, nor to materials which are less than 1/28 inch (0.9 mm) thick cemented to the surface of walls or ceilings.

803.2 Classification. Interior finish materials other than those applied to floors shall be classified in accordance with ASTM E 84. Such interior finish materials shall be grouped in the following classes in accordance with their flamespread and smoke development:
1. Class A Interior Finish. Flamespread 0-25, Smoke Developed 0-450. Any element thereof when so tested shall not continue to propagate fire.
3. Class C Interior Finish. Flamespread 76-200, Smoke Developed 0-450.

803.3 Interior finish requirements based on occupancy

803.3.1 The minimum flamespread classification of interior finish other than floor finish and floor coverings shall be based on the use or occupancy as set forth in Table 803.3.

Exceptions:

1. Except in Group I occupancies and in enclosed vertical exits, Class C interior finish material may be used in access to exits and other spaces as wainscoting extending not more than 48 inches (1219 mm) above the floor and for tack and bulletin boards covering not more than 5% of the gross wall area of the room. In Group I occupancies, Class B interior finish material may be used in access to exits as wainscoting extending not more than 48 inches (1219 mm) above the floor.
2. The exposed faces of Type III structural members including decking and planking, where otherwise permitted by this code, are excluded from flamespread requirements.
3. For churches or places of worship, nothing in this section shall prevent the use of wood for ornamental purposes, trusses, paneling, or chancel furnishing.

<table>
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Notes:

1. In vertical exitways of buildings three stories or less in height of other than Group I Restrained, the interior finish may be Class B for unsprinklered buildings and Class C for sprinklered buildings.
2. Class C interior finish materials may be used within a dwelling unit.
3. Rooms with 4 or less persons require Class C interior finish.
4. Class C interior finish materials are not permitted in Group R4 occupancies.
803.3.2 Imitation leather or other material, consisting of, or coated with a pyroxylin or similarly hazardous base, shall not be used in Group A occupancies.

803.4 Foam plastics. Foam plastics shall not be used as interior finish.

Exception: Foam plastic trim, defined as picture molds, chair rails, baseboards, handrails, ceiling beams, door trim and window trim shall be permitted to be used provided:
1. The minimum density is 20 lb/cu ft (320 kg/m³).
2. The maximum thickness of the trim is 1/2 inch (12.7mm) and the maximum width is 4 inches (102 mm)
3. The trim constitutes no more than 10% of the area of any wall or ceiling.
4. The flamespread rating does not exceed 75 when tested per ASTM E 84. The smoke developed rating is not limited.

803.5 Carpet on walls and ceilings
803.5.1 Textile materials having a napped, tufted, looped, woven, nonwoven, or similar surface may be used as interior finish on ceilings only when said materials have a flamespread rating of 25 or less in accordance with ASTM E 84.

803.5.2 Textile wall coverings, including materials such as those having a napped, tufted, looped, nonwoven, woven or similar surface, shall comply with one of the following:
1. Textile wall coverings shall have a flamespread index of 25 or less in accordance with ASTM E 84 and shall be protected by automatic sprinklers, or
2. Textile wall coverings shall meet the acceptance criteria specified in 803.5.3 when tested in accordance with NFPA 265 using the product mounting system, including adhesive, of actual use.

803.5.3 Acceptance criteria
803.5.3.1 Textile wall coverings tested in accordance with NFPA 265 shall be considered as demonstrating satisfactory performance if, during the screening test protocol, all of the following conditions are met:
1. Flame shall not spread to the ceiling during the 40 kW exposure.
2. During the 150 kW exposure, the following criteria shall be met:
   1. Flame shall not spread to the outer extremity of the sample on the 8 ft x 12 ft wall.
   2. The specimen shall not burn to the outer extremity of the 2 ft wide samples mounted vertically in the corner of the room.
   3. Burning droplets shall not be formed and drop to the floor which are judged to be capable of igniting the textile wall covering or which persist in burning for 30 seconds or more.
4. Flashover shall not occur. Flashover may be judged to occur when the heat flux at floor level exceeds 20 kW/m² upper level air tempera-

5. The maximum instantaneous net peak rate of heat release shall not exceed 300 m The maximum instantaneous net peak rate of heat release is derived by taking the measured maximum rate of heat release and subtracting the burner output.

803.5.3.2 Textile wall coverings which fail to meet the criteria of 803.5.3.1 shall be judged to perform satisfactorily when tested following the fully lined test protocol and when meeting all of the following criteria:
1. Flame shall not spread to the ceiling during the 40 kW exposure.
2. During the 150 kW exposure, the following criteria shall be met:
   1. Flame shall not spread to the outer extremities of the samples on the 8 ft x 12 ft walls.
   2. Flashover shall not occur. Flashover may be judged to occur when the heat flux at floor level exceeds 20 kW/m² upper level air temperatures exceed 1100°F or flames project out the room door opening.

803.6 Expanded vinyl wall coverings
803.6.1 Expanded vinyl wall coverings shall comply with the requirements for textile wall and ceiling materials and its use shall be in accordance with 803.5.2.

803.7 Floor finish
803.7.1 In buildings of Type I or Type II construction, floor finish, if of combustible material, shall be applied directly upon the floor construction, except that a floor finish of wood, linoleum, rubber, tile or cork may be secured to a subfloor of wood. Where wood sleepers are used for laying wood floors or subfloors in such buildings, they shall be fireblocked so that there will not be an open space extending under any permanent partition. Where wood sleepers are used and the space between the floor slab and the underside of the floor or subfloor is more than 2 1/2 inches (64 mm), such space shall be filled with non-combustible material so that such space is not more than 2 1/2 inches (64 mm).

803.7.2 Combustible insulating boards may be used for sound deadening or insulating of floors, except that in buildings required to be of Type I or Type II construction, such insulating board shall not be more than 1/2 inch (12.7 mm) thick and cemented directly to the floor slab or secured to wood sleepers fireblocked as called for above and covered with approved finish flooring.

803.8 Floor covering
803.8.1 Finished floors or floor covering materials of a traditional type, such as wood, vinyl, linoleum, terrazzo and other resilient floor covering materials, are exempt from the requirements of this section. Carpet type floor coverings shall be tested as proposed for use including underlayment
CHAPTER 9
FIRE PROTECTION SYSTEMS

SECTION 901
GENERAL

901.1 Scope. Provisions of this chapter shall govern the application, design, installation, testing and maintenance of automatic sprinklers, standpipes and fire alarms.

SECTION 902
DEFINITIONS

For definitions, see Chapter 2.

SECTION 903
SPRINKLERS

903.1 Approved equipment and layout. Only approved sprinklers and devices shall be used in automatic sprinkler systems and the complete layout of the system shall be submitted to the building official for approval before installation.

903.2 Requirements. Every automatic sprinkler system required by this code shall conform to NFPA 13, as modified by NFPA 231 and NFPA 231C, except that a single water supply of adequate pressure, capacity and reliability, equal to the primary supply required by those standards, may be permitted by the building official. Automatic sprinkler systems installed in lieu of or as an alternate to other requirements, as permitted by this code, shall be considered required systems and shall comply with NFPA 13.

903.3 Material. Piping shall be as specified in NFPA 13.

903.4 Hose threads. All hose threads in connections shall be uniform with that used by the fire department of the applicable governing body.

903.5 General. Approved automatic sprinkler equipment meeting the requirements of 903 shall be installed in buildings as follows:

1. Basements having floor areas exceeding 2,500 sq ft (232 m²) when used as workshops or for manufacture, repair, sale or storage of combustible materials or when used as lounges or nightclubs regardless of the size. See 503.4.1, Exception 2.
2. In buildings which do not have suitable access, as set forth in 1405, to each story above grade on at least one accessible side of the building. Openings, which are glazed with security glazing designed to withstand breakage, shall not be considered as access openings.
4. See 407.1.3, 411.7.6 and 411.7.7.
5. Spray finishing booth, area or room shall comply with Chapter 10 of the Standard Fire Prevention Code.

903.6 Garages. Approved automatic sprinkler systems shall be provided in the following garages:

1. Enclosed parking garages over 35 ft (10m) high and exceeding 10,000 sq ft (929 m²) per floor.
2. Repair garages two stories or more high.
3. One story repair garages exceeding 15,000 sq ft (1394 m²).
4. Basement garages or repair garages with provisions for six (6) or more cars.

Exception: Group R3 occupancies.

5. Garages used for the storage of commercial trucks and having an area exceeding 5,000 sq ft (465 m²).
6. Bus garages when used as passenger terminals for four or more buses or when used for bus storage or loading of four or more buses.
7. Enclosed garages below other occupancies or attached to other occupancies.

903.7 Other occupancy sprinkler requirements

903.7.1 Group M. An approved automatic sprinkler system shall be provided in stores and similar occupancies where stocks of combustible materials are on display for public sale and where the story floor area exceeds 12,000 sq ft (1116 m²).

903.7.2 Group A

903.7.2.1 An approved automatic sprinkler system shall be provided in Group A-1 occupancies over areas, which could be used for the display, sale or storage of combustible materials when such display, sale or storage floor area exceeds 12,000 sq ft (1116 m²).

903.7.2.2 Stages shall be provided with an approved automatic sprinkler system. Such sprinklers shall be provided throughout the stage and in dressing rooms, workshops, storerooms, and other accessory spaces contiguous to such stages.

Exceptions:

1. Sprinklers are not required where stages are 1,000 sq ft (93 m²) or less in area and 50 ft (15.2 m) or less in height and 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.
2. Sprinklers are not required under stage areas less than 4 ft (1219 mm) in clear height used exclusively for chair or table storage and lined on the inside with 5/8 inch (15.9 mm)
Type X gypsum wallboard or approved equal.

903.7.2.3 Buildings or portions thereof used for the specific purpose of sound stages for motion picture or television productions and greater than 1,000 sq ft (93 m²) shall be protected with an approved automatic sprinkler system.

903.7.3 High-Piled combustible stock. An approved automatic sprinkler system shall be provided throughout buildings required to have sprinkler protection by Chapter 36 of the Standard Fire Prevention Code.

Exception: Automatic sprinkler systems may be provided only in the storage area of the building when the storage is separated from the remainder of the building by a minimum 2-hour fire resistant separation.

903.7.4 Hazardous production material (HPM) facility. An approved automatic sprinkler system shall be provided throughout buildings containing Group H (HPM) facilities as defined in 408, shall be designed in accordance with NFPA 13 and not less than that required for the special fire hazard areas shown in Table 903.7.4.

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<thead>
<tr>
<th>LOCATION</th>
<th>NFPA HAZARD GROUP</th>
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<td>Fabrication Areas</td>
<td>Ordinary Hazard Group 2</td>
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<tr>
<td>HPM Service Corridors</td>
<td>Ordinary Hazard Group 2</td>
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<tr>
<td>HPM Separate Inside Storage Rooms</td>
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<tr>
<td>Exit Access Corridors</td>
<td>Ordinary Hazard Group 2</td>
</tr>
</tbody>
</table>

903.7.5 Group R1 - Residential Occupancy. An approved automatic sprinkler system shall be provided throughout Group R 1 occupancies three or more stories in height or containing sixteen (16) or more Guest Rooms.

903.7.6 Group R2 - Residential Occupancy. An approved automatic sprinkler system shall be provided throughout Group R2 occupancies three or more stories in height.

Exceptions:
1. Three-story buildings which are not required to have an automatic sprinkler system by other provisions of the code and provided with exterior exitway stairs complying with 1006.2.
2. An automatic sprinkler system complying with NFPA 13R shall be permitted for buildings not exceeding four stories in height provided the automatic sprinkler system shall not be considered as an alternate to other requirements of the code. See 903.2.

903.7.7 Group R4 - Residential Care/Accomplished Living Occupancies. An approved automatic sprinkler system shall be provided throughout all Group R4 occupancies in accordance with NFPA 13. Group R4 occupancies shall be protected with quick-response or residential sprinklers.

Exception: In Group R4 Small Occupancies an automatic sprinkler system installed in accordance with NFPA 13D or NFPA 13R in accordance with their scopes shall be permitted provided the automatic sprinkler system shall not be considered an alternate to other requirements of the code.

903.8 Supervision

903.8.1 Where an automatic sprinkler system is provided either as a requirement or as an alternate to another requirement of this code, the system shall be supervised by an approved central, proprietary, auxiliary, or remote station system in accordance with NFPA 72.

Exception: Supervisory facilities in accordance with 903.8 shall not be required for extinguishing systems in one and two family dwellings.

903.8.2 In HPM Facilities, as defined in 408, all valves shall be provided with supervisory tamper switches. In addition to the requirements of 903.8.1, the closing of a valve shall activate an audible and visual signal at the emergency control station.

903.8.3 When a building fire alarm system is provided, actuation of the sprinkler system shall cause the building alarm to sound.

SECTION 904
STANDPIPES

904.1 Approval

904.1.1 Unless otherwise provided herein, standpipe system design, installation and testing requirements shall comply with NFPA 14.

904.1.2 The complete layout of the standpipe and hose system shall be submitted to the building official before installation.

904.2 Where required

904.2.1 Standpipes shall be provided in all buildings in which the highest floor is greater than 30 ft (9144 mm) above the lowest level of fire department vehicle access.
Exception: Standpipes are not required in Group R3 buildings.

904.2.2 Standpipes shall be provided in buildings in which the highest floor is 30 ft (9144 mm) or less above the lowest level of fire department vehicle access and exceeding 10,000 sq ft (929 m²) in area per story when any portion of the building's interior area is more than 200 ft (61 m) of travel from the nearest point of fire department vehicle access.

Exceptions:
1. Standpipes are not required in Group R2 with 8 units or less, R3 and S2 occupancies.
2. Standpipes are not required in buildings protected throughout with automatic sprinklers installed in accordance with NFPA 13.

904.2.3 Stages greater than 1,000 sq ft (93 m²) in area shall be provided with a standpipe on each side of the stage.

904.2.4 Covered malls shall be provided with standpipe connections in accordance with 413.9.

904.2.5 Standpipes shall be provided in public assembly halls more than 5,000 sq ft (165 m²) in area used for exhibition or display purposes.

904.2.6 Standpipes shall be provided in nonsprinklered Group A buildings having an occupant load exceeding 1,000 persons.

904.3 Class and type system
904.3.1 Standpipes required by 904.2.1 and 904.2.6 shall be Class I automatic wet standpipes.

Exception: Class I automatic and semi-automatic dry standpipes shall be permitted in those buildings where the highest floor surface used for human occupancy is 55 ft (16.8 m) or less above the lowest level of fire department vehicle access.

904.3.2 Standpipes required by 904.2.3 shall be Class III wet standpipes.

904.3.3 Standpipes required by 904.2.5 shall be Class II wet standpipes.

904.3.4 Standpipes required by 904.2.2 shall be Class I dry filled standpipes having a small water supply connection to keep the piping full but requiring water to be pumped into the system for fire fighting purposes or any Class I standpipe permitted by 904.2.

904.3.5 In buildings requiring standpipes in accordance with 904.2, dry standpipes having no permanent water supply may be installed when in the opinion of the building official and the fire official, a constant and automatic water supply is not necessary.

904.4 Hose connection location. Hose connections for standpipes shall be in accordance with NFPA 14.

904.5 Standpipes during construction. See 3311.3 for standpipes required during construction.

904.6 Supervisory facilities. Where a building fire alarm system is provided, the closing of any standpipe water supply valve including any valves associated with a fire pump installation shall cause an audible supervisory signal to sound at the fire alarm annunciator or at a constantly attended location. If the building does not have a fire alarm system, locks shall be provided on all valves and shall be of a type acceptable to the building official.

904.7 Water supply
904.7.1 Standpipe piping may be used to supply water for automatic sprinkler systems.

904.7.2 For nonsprinklered buildings, and sprinklered buildings having floor surfaces used for human occupancy located more than 55 ft (16.8 m) above the lowest level of fire department vehicle access, the water supply shall meet the requirements of NFPA 14.

904.7.3 For sprinklered buildings having floor surfaces used for human occupancy located 75 ft (22.9 m) or less above the lowest level of fire department vehicle access, required water supply shall meet minimum water pressure requirements of NFPA 13 and shall be:
1. 500 GPM (31.6 L/s) for light hazard occupancy as defined in NFPA 13.
2. 1,000 GPM (63.1 L/s) for ordinary hazard occupancy as defined in NFPA 13.
3. In no case shall the water supply be less than the automatic sprinkler demand including hose stream allowance.

904.8 Signs. If control valves are located in a separate room, a sign shall be provided on the entrance door to that room. The lettering shall be at least 4 inches (102 mm) high, of a color contrasting with the background, and shall read STANDPIPE CONTROL VALVE.

SECTION 905
FIRE ALARMS

905.1 Manual fire alarm systems
905.1.1 General. A fire alarm system in accordance with NFPA 72 shall be installed in all the following occupancies:

Group A, all group A occupancies.

Group B having an occupant load of 250 or more persons or more than 100 persons above or below the street floor.

Group E.

Group F two stories or more in height, and having an occupant load of 250 or more persons above or below the street floor level.

Group H.
905.1.2 Manual fire alarm boxes shall be located not more than 5 ft (1524 mm) from the entrance to each exit.

905.1.3 Each floor shall be zoned separately. No one zone may exceed 15,000 sq ft (1394 m²). A zone indicator panel shall be located at grade level at the normal point of fire department access or at a constantly attended building security control center.

Exception: Automatic sprinkler system zones shall not exceed the area permitted by NFPA 13.

905.1.4 Upon completion of the fire alarm system, all alarm initiating devices and circuits, alarm indicating appliances and circuits, supervisory signal initiating devices and circuits, signaling line circuits, and primary and secondary power supplies shall be subjected to a 100% acceptance test in accordance with NFPA 72.

905.1.5 Alarm indicating appliances

905.1.5.1 Required. Alarm indicating appliances listed for the purpose shall be provided.

905.1.5.2 Every required fire alarm system shall include visible alarm indicating appliances in public and common areas.

905.1.5.3 Activation. The alarm indicating appliances shall be automatically activated by all of the following where provided:
1. Smoke detectors, other than single-station or multiple-station smoke detectors, as required by 905.2. Activation of the alarm system by smoke detectors shall be by either two cross-zoned smoke detectors within a single protected area or a single smoke detector monitored by an alarm verification zone or an approved equivalent method.
2. Sprinkler water-flow devices;
3. Manual fire alarm boxes; and
4. Other approved types of automatic fire detection device suppression systems.

905.1.5.4 Audible Alarms. Audible alarm indicating appliances shall provide a distinctive sound which shall not be used for any purpose other than that of a fire alarm. Such devices shall provide a sound pressure level of 15 dBA above the average ambient sound level in every occupied space within the building. The minimum sound pressure levels shall be: 70 dBA in buildings of Group R occupancy, 90 dBA in mechanical equipment rooms; and 60 dBA in all other occupancy classifications. The maximum sound pressure level for audible alarm indicating appliances shall not exceed 130 dBA at the minimum hearing distance from the audible appliance.

905.2 Automatic fire detection

905.2.1 Approved single-station or multiple-station smoke detectors shall be installed in accordance with NFPA 72, Chapter 2, within every dwelling and every dwelling unit within an apartment house, condominium or townhouse, and every guest or sleeping room in a motel, hotel, dormitory, and sleeping rooms in residential care/assisted living occupancies. Where more than one detector is required to be installed within an individual dwelling unit, the detectors shall be wired in such a manner that the actuation of the alarm will actuate all of the alarms in the individual unit.

905.2.2 In dwellings and dwelling units, a smoke detector shall be mounted on the ceiling or wall at a point centrally located in the corridor or area giving access to each group of rooms used for sleeping purposes. Where the dwelling or dwelling unit contains more than one story, detectors are required on each story including basements, but not including uninhabitable attics, and shall be located in close proximity to the stairway leading to the floor above.

905.2.3 In dwelling units with split levels and without an intervening door between the adjacent levels, a smoke detector 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.

905.2.4 Smoke detectors connected to a fire alarm system shall be installed in accordance with NFPA 72.
### TABLE 1004
TRAVEL DISTANCE, DEAD-END LENGTH, EXIT AND MEANS OF EGRESS WIDTH

<table>
<thead>
<tr>
<th>OCCUPANCY CLASSIFICATION</th>
<th>MAXIMUM TRAVEL DIST. TO EXIT (ft)</th>
<th>MAXIMUM DEAD END CORRIDOR LENGTH (ft)</th>
<th>EGRESS WIDTH PER PERSON SERVED (in)</th>
<th>MINIMUM CORRIDOR/ AISLE WIDTH OF EXIT (in)</th>
<th>MINIMUM CLEAR OP’G STAIRS (in)</th>
<th>MINIMUM STAIR WIDTH (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>200</td>
<td>250</td>
<td>20</td>
<td>0.2</td>
<td>0.37&lt;sup&gt;14&lt;/sup&gt;</td>
<td>44&lt;sup&gt;1.10&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group B</td>
<td>200</td>
<td>250</td>
<td>20</td>
<td>0.2</td>
<td>0.37&lt;sup&gt;14&lt;/sup&gt;</td>
<td>44&lt;sup&gt;1.10&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group E</td>
<td>200</td>
<td>250</td>
<td>20</td>
<td>0.2</td>
<td>0.37&lt;sup&gt;14&lt;/sup&gt;</td>
<td>72&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group F</td>
<td>200</td>
<td>250</td>
<td>20</td>
<td>0.2</td>
<td>0.37&lt;sup&gt;14&lt;/sup&gt;</td>
<td>44&lt;sup&gt;10&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group H</td>
<td>NP</td>
<td>100&lt;sup&gt;13&lt;/sup&gt;</td>
<td>20</td>
<td>0.4</td>
<td>0.7</td>
<td>44&lt;sup&gt;10&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group I</td>
<td></td>
<td></td>
<td>20</td>
<td>0.2</td>
<td>0.37&lt;sup&gt;14&lt;/sup&gt;</td>
<td>48</td>
</tr>
<tr>
<td>Restrained Group I</td>
<td></td>
<td></td>
<td>20</td>
<td>0.2</td>
<td>0.37&lt;sup&gt;14&lt;/sup&gt;</td>
<td>48</td>
</tr>
<tr>
<td>Unrestrained Group I</td>
<td>150</td>
<td>200</td>
<td>20</td>
<td>0.2</td>
<td>0.3714</td>
<td>44&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group M</td>
<td>200</td>
<td>250</td>
<td>20</td>
<td>0.2</td>
<td>0.3714</td>
<td>44&lt;sup&gt;4.10&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group R</td>
<td>200</td>
<td>250</td>
<td>20&lt;sup&gt;8&lt;/sup&gt;</td>
<td>0.2</td>
<td>0.3714</td>
<td>44&lt;sup&gt;5.10&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group S</td>
<td>200&lt;sup&gt;6&lt;/sup&gt;</td>
<td>250&lt;sup&gt;6,7&lt;/sup&gt;</td>
<td>20</td>
<td>0.2</td>
<td>0.3714</td>
<td>44&lt;sup&gt;10&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

For SI: 1 in = 25.4 mm, 1 ft = 0.305 m.

**Notes:**
1. See 1019.10.2.
2. For occupant loads less than 100 persons, 44 inches may be used.
3. 96 inches shall be provided in areas requiring the movement of beds.
4. 4. See 413 for covered mall buildings.
5. 36 inches shall be permitted within dwelling units.
6. Maximum travel distance shall be increased to 300 ft if unsprinklered and 400 ft if sprinklered for Group S2 occupancies and open parking structures constructed per 4.11.
7. See 1004.1.6 for exceptions.
8. See 1026.1.1 for exceptions.
9. 44 inches required in areas requiring movement of beds.
10. 36 inches acceptable if stair or corridor serves occupant load of less than 50.
11. See 1024.2.6.
12. Applies to ramps, doors and corridors.
13. For HPM Facilities, as defined in 408, the maximum travel distance shall be 100 ft.
14. Use 0.3 for stairs having tread depths 11 inches or greater and riser heights between 4 inches minimum and 7 inches maximum.

**1004.1.4** Where two or more exits or exit access doors are required, at least two of the exits or exit access doors shall be placed a distance apart equal to not less than one half of the length of the maximum overall diagonal dimension of the building or area to be served measured in a straight line between such exits or exit access doors. The two exits or exit access doors shall be so located and constructed to minimize the possibility that both may be blocked by any one fire or other emergency condition.

**Exception:** When exit enclosures are provided as a portion of the required exit and are interconnected by a corridor conforming to the requirements for 1-hour rated construction, the exit separation may be measured along a direct line of travel within the corridor.

**1004.1.5** Where open stairways or ramps are permitted as part of the path of travel to required exits, such as between mezzanines, balconies and the floor below, the travel distance shall include:
1. The distance to reach the stair ramp.
2. The line of travel on a stair measured in the plane of the stair nosing.
3. The distance from the end of the stair or ramp to the exit.

**1004.1.6** In one-story Group F and Group S buildings equipped with automatic heat and smoke vents complying with this section and sprinklered, the travel distance may be increased to 400 ft (122 m). Smoke and heat vents shall be constructed and installed in a manner approved by the building official.

**1004.1.6.1** Smoke and heat vents shall be designed to operate automatically after the design activation time of the sprinkler system. Vents shall be capable of being opened by an approved manual operation.

**1004.1.6.2** Smoke and heat vents shall be located so that no portion of the vent opening is directly above or within 8 inches (203 mm) of sprinklers.
1004.1.6.3 Curtain boards constructed in accordance with this section shall be provided to subdivide a vented building.

**Exception:**
1. When a smoke and heat venting system complies with the guidelines of NFPA 204M.
2. When a building is protected by ESFR sprinklers installed in accordance with NFPA 13 and NFPA 231 or NFPA 231 C.

1004.1.6.3.1 Curtain boards shall be constructed of material that will resist the passage of smoke and consistent with the building type of construction.

1004.1.6.3.2 Curtain boards location and depth shall comply with Table 1004.1.6.

1004.1.6.4 Maximum spacing of roof vents and vent area shall comply with Table 1004.1.6.

**Exception:** When a smoke and heat venting system complies with the guidelines of NFPA 204M.

1004.1.6.5 Roof Vents and Curtain Boards. Storage occupancies exceeding 5,000 sq ft in area shall be provided with a smoke and heat venting system complying with table 104 or NFPA 204M.

1004.2 Minimum number of exits
1004.2.1 There shall be not less than two approved independent exits, accessible to each tenant area, serving every story, except in Group R3 occupancies and as modified in 1018.

1004.2.2 The minimum number of exits for all occupancies, except as modified by 1018, based on occupant load, shall be as follows:

<table>
<thead>
<tr>
<th>Minimum Number of Exits</th>
<th>Occupancy Load per Story</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1 -500</td>
</tr>
<tr>
<td>3</td>
<td>501 - 1,000</td>
</tr>
<tr>
<td>4</td>
<td>more than 1,000</td>
</tr>
</tbody>
</table>

1004.2.3 Sufficient exit facilities shall be provided so that the aggregate capacity of all such exits, determined in accordance with this chapter, shall be not less than the occupant load as determined from 1003.1.

### Table 1004.1.6

**ROOF VENT SIZE AND SPACING FOR INCREASED TRAVEL DISTANCE IN GROUPS F AND S**

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>HAZARD CLASSIFICATION¹</th>
<th>VENT HEIGHT H²</th>
<th>MINIMUM CURTAIN BOARD DEPTH³</th>
<th>MAXIMUM AREA FORMED BY CURTAIN BOARDS (sq ft)</th>
<th>VENT AREA TO FLOOR AREA RATIO</th>
<th>MAXIMUM SPACING OF VENT CENTERS</th>
<th>MAXIMUM DISTANCE FROM WALL OR CURTAIN BOARDS</th>
<th>MAXIMUM DISTANCE BETWEEN CURTAIN BOARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>-</td>
<td>-</td>
<td>0.2H (4 ft min.)</td>
<td>50,000</td>
<td>1:100</td>
<td>120 ft</td>
<td>60 ft</td>
<td>8H but &lt; 250 ft</td>
</tr>
<tr>
<td>S</td>
<td>1 through IV</td>
<td>20 ft or less</td>
<td>6 ft</td>
<td>10,000</td>
<td>1:100</td>
<td>100 ft</td>
<td>60 ft</td>
<td>8H</td>
</tr>
<tr>
<td>S</td>
<td>1 through IV</td>
<td>Over 20 ft to 40 ft</td>
<td>6 ft</td>
<td>8,000</td>
<td>1:75</td>
<td>100 ft</td>
<td>55 ft</td>
<td>81-1 but &lt; 250 ft</td>
</tr>
<tr>
<td>S</td>
<td>1 through IV</td>
<td>20 ft or less</td>
<td>4 ft</td>
<td>3,000</td>
<td>1:75</td>
<td>100 ft</td>
<td>55 ft</td>
<td>8H</td>
</tr>
<tr>
<td>S</td>
<td>1 through IV</td>
<td>Over 20 ft to 40 ft</td>
<td>4 ft</td>
<td>3,000</td>
<td>1:50</td>
<td>100 ft</td>
<td>50 ft</td>
<td>81-1 but &lt; 250 ft</td>
</tr>
<tr>
<td>S</td>
<td>v</td>
<td>20 ft or less</td>
<td>6 ft</td>
<td>6,000</td>
<td>1:50</td>
<td>100 ft</td>
<td>50 ft</td>
<td>81-1</td>
</tr>
<tr>
<td>S</td>
<td>v</td>
<td>Over 20 ft to 30 ft</td>
<td>6 ft</td>
<td>6,000</td>
<td>1:40</td>
<td>90 ft</td>
<td>45 ft</td>
<td>81-1</td>
</tr>
<tr>
<td>S</td>
<td>v</td>
<td>30 ft or more</td>
<td>4 ft</td>
<td>2,000</td>
<td>1:30</td>
<td>75 ft</td>
<td>40 ft</td>
<td>8H but &lt; 100 ft</td>
</tr>
</tbody>
</table>

For SI: 1 ft = 0.305 m, 1 sq ft = 0.0929 m².

**Notes:**
1. See Chapter 36 of the Standard Fire Prevention Code for classification of Contents Class I thru IV. Class V commodities are products which present special fire hazards beyond those of Class I, II, III or IV, such as aerosols, foamed plastic, PVC, polyurethane, polystyrene, and asphalt paper.
2. H is the height of the vent above the floor.
3. The depth of the curtain board shall be measured from the bottom of the vent. The bottom of the curtain board shall be level.
1005.5 Security bars, grilles and grates. Each sleeping room or room with a required exit door in a residential occupancy that has security bars, grilles, grates or similar devices installed shall have at least one emergency escape and rescue opening.

1005.6 Smokeproof enclosures

1005.6.1 Where the floor surface of any story is located more than 55 ft (16.78 m) above the lowest level of a building or department vehicle access, each of the required exits for the building shall be a smokeproof enclosure.

1005.6.2 A minimum 2-hour fire resistant construction shall be used for smokeproof enclosures. In each case openings into the required 2-hour construction shall be limited to those needed for maintenance and operation and shall be protected by self-closing 1 1/2-hour fire resistance rated devices. The supporting frame shall be protected as set forth in Chapter 6.

1005.6.3 Group B buildings exceeding 15,000 sq ft (1395 m²) per floor and complying with the area of refuge (compartmentation) option described in 412.9 are exempt from the smokeproof enclosure requirements.

1005.6.4 Stairs in smokeproof enclosures shall be of noncombustible construction.

1005.6.5 A smokeproof enclosure shall exit into a public way or into an exit passageway, yard, open court or open space having direct access to a public way. The exit passageway shall be without other openings and shall have walls, floors, and ceiling of 2-hour fire resistance.

1005.6.6 A stairway in a smokeproof enclosure shall not continue below the grade level unless an approved barrier is provided at the ground level to prevent persons from accidentally continuing into the basement.

1005.6.7 Access to the stairway shall be by way of a vestibule or by way of an open exterior balcony of noncombustible materials.

Exception: Access by way of a vestibule or an open exterior balcony is not required when the stairway meets the requirements of 1005.6.9.2, 1005.6.9.9 and 1005.6.9.10 and is located in a fully sprinklered building.

1005.6.8 Smokeproof enclosures by natural ventilation.

1005.6.8.1 Where a vestibule is provided, the door assembly into the vestibule shall have a 1 1/2-hour fire resistance rating and the door assembly from the vestibule to the stairs shall have not less than a 20 minute fire resistance rating. The doors shall have closing devices as specified in 1005.6.9.10. Wired glass 1/4 inch (6.4 mm) thick may be installed not to exceed 100 sq in (0.065 m²) with neither dimension exceeding 12 inches (305 mm).

1005.6.8.2 The vestibule shall have a minimum of 16 sq ft (1.49 m²) of opening, in a wall facing an exterior court, yard or public way at least 20 ft (6096 mm) wide. The vestibule shall be a minimum of 44 inches (1118 mm) wide and 72 inches (1829 mm) in the direction of travel.

1005.6.8.3 Where access to the stairway is by means of an open exterior balcony, the door assembly to the stairway shall have a 1 1/2-hour fire resistance rating. Doors shall have closing devices as specified in 1005.6.9.10.

1005.6.9 Smokeproof enclosures by mechanical ventilation

1005.6.9.1 Stair pressurization systems shall be independent of other building ventilation systems.

1005.6.9.2 Equipment and ductwork for stair pressurization shall comply with one of the following:
1. Be located exterior to the building and be directly connected to the stairway or connected to the stairway by ductwork enclosed in 2-hour construction.
2. Be located within the stair enclosure with intake or exhaust air directed to the outside or through ductwork in 2-hour construction.
3. Be located within the building if separated from the remainder of the building, including other mechanical equipment, with 2-hour construction.

1005.6.9.3 The door from the building into the vestibule shall have a 1 1/2-hour fire resistance rating and have closing devices as specified in 705.1.3.2.3. The door from the vestibule to the stairway shall have a minimum 20-minute fire resistance rating and have closing devices as specified in 705.1.3.2.3. Wired glass, if provided, shall not exceed 100 sq in (0.065 m²) and shall be set in a steel frame. The door shall be provided with a drip sill or other provision to minimize air leakage.

1005.6.9.4 Where access to the stairway is by means of an open exterior balcony, the door assembly to the stairway shall have a 1 1/2-hour fire resistance rating. Doors shall have closing devices as specified in 1005.6.9.10.

1005.6.9.5 The vestibule shall have a minimum dimension of 44 inches (1118 mm) wide and 72 inches (1829 mm) in direction of exit travel.

1005.6.9.6 The vestibule shall be provided with not less than one air change per minute and the exhaust shall be 150% of the 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 no more than 6 inches (152 mm) down from the top of the trap and shall be entirely within the smoke trap area. Doors, when in the open position, shall not obstruct duct openings. Duct openings may be provided with controlling dampers if needed, to meet the design requirements but are not otherwise required.

1005.6.9.7 For buildings where such air changes would result in excessively large duct and blower requirements, a specially engineered system may be used. Such an engineered system shall provide 2,500 cfm (1.2 m³/s) exhaust from a vestibule when in emergency operation and shall be sized to handle three vestibules simultaneously. The smoke detector located outside each vestibule shall release to open the supply and exhaust duct dampers in that affected vestibule.

1005.6.9.8 The vestibule ceiling shall be at least 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 20-inch (508 mm) height requirement may be reduced proportionally if the minimum vestibule size described in 1005.6.9.5 is enlarged so as to maintain the same volume in the smoke trap area above the door when justified by design and test. In any case, minimum ceiling height shall not be less than 7 ft 6 in (2286 mm).

1005.6.9.9 The stair shaft shall be provided with mechanical supply and exhaust air. There shall be a minimum of 2,500 cfm (1.2 m³/s) discharge through a dampered relief opening or an exhaust fan at the top of the stair shaft. The supply shall be sufficient to provide a minimum positive pressure of 0.05-inch water column (12.5 Pa) in addition to the maximum anticipated stack pressure, relative to other parts of the building measured with all doors closed. The combined positive pressure shall not exceed 0.35-inch water column (87 Pa). The air supply shall be taken directly from outside of the building. The stair pressure shall be static pressures measured at the level of discharge from the stair.

Exception: The minimum positive pressure shall be increased to 0.15-inch water column (37 Pa) in an unsurprinklered building.

1005.6.9.10 The activation of the ventilating equipment shall be initiated by a smoke detector installed outside the vestibule door in an approved location. When the closing device for the stair shaft and vestibule doors is activated by smoke detection or power failure, the closing devices on all doors in the smokeproof enclosure at all levels shall be activated and the mechanical equipment shall operate at the levels specified in items 1005.6.9.6 and 1005.6.9.9.

1005.7 Mezzanines
1005.7.1 Two means of egress shall be provided from any mezzanine with an occupant load or travel distance to an exit or to a point where there is a choice of more than one means of egress which exceeds that shown in Table 1005.7.

<table>
<thead>
<tr>
<th>USE</th>
<th>OCCUPANT LOAD</th>
<th>MAXIMUM TRAVEL DISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly</td>
<td>50</td>
<td>75 ft</td>
</tr>
<tr>
<td>Business</td>
<td>30</td>
<td>75 ft</td>
</tr>
<tr>
<td>Courtrooms</td>
<td>50</td>
<td>75 ft</td>
</tr>
<tr>
<td>Educational</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom</td>
<td>50</td>
<td>75 ft</td>
</tr>
<tr>
<td>Shops and vocational</td>
<td>50</td>
<td>75 ft</td>
</tr>
<tr>
<td>Industrial</td>
<td>50</td>
<td>75 ft</td>
</tr>
<tr>
<td>Institutional</td>
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<tr>
<td>Other floors</td>
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<td>75 ft</td>
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<tr>
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<tr>
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<td></td>
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<tr>
<td>Hotels &amp; apartments</td>
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<tr>
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<td>75 ft</td>
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<tr>
<td>Storage</td>
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<td>100 ft</td>
</tr>
</tbody>
</table>

For SI: 1 ft = 0.305 m.

Notes:
1. Maximum area with one exit or exit access door shall be 200 sq ft.

1005.7.2 If any required means of egress is through the room below, the occupant load of the mezzanine shall be added to the occupant load of the room in which it is located.

1005.7.3 Egress stairways from mezzanines shall conform with the requirements of 1007. They may be open and may descend to the floor of the room in which they are located when all the following conditions are met:

1. The space beneath the mezzanine is totally open and unencumbered by partitioned rooms or spaces.

Exception: The space beneath the mezzanine may be enclosed provided the enclosed space is protected throughout with a smoke detection system in accordance with NFPA 72 which sounds an alarm in the mezzanine.

2. The travel distance from the most remote point on the floor of the mezzanine to the building exit or to a protected egress corridor, exit court, horizontal passageway, enclosed stairway, or exterior exitway balcony, inclusive of travel on the stairway, does not exceed 75 ft (22.9 m) where a single means of egress is permitted, or the limits of Table 1004 where multiple means of egress are required.
3. The occupant load of the mezzanine is added to the occupant load of the story or room in which it is located for purposes of determining the egress requirements of such story or room.
4. The mezzanine is not occupied for sleeping purposes, unless there are exterior windows accessible to the mezzanine and located not more than two stories above grade.

SECTION 1006
STAIRWAY PROTECTION

1006.1 Enclosed stairways

1006.1.1 Exit stairways between floors shall be enclosed in or separated by fire resistant construction in accordance with 705.2 and Table 705.1.2.

Exceptions:
1. Stairways serving and contained within a dwelling, dwelling unit, or hotel suite.
2. Exterior stairways conforming to 1006.2.
3. In open automobile parking garages when the stair is on an open side, as defined in 411.3.2.
4. In open parking garages, having all sides open.

1006.1.2 Except in one and two family dwellings, basement stairways located under stairways from upper stories shall be completely enclosed by construction providing fire resistance not less than required for the stair enclosure above the basement but in no case less than 1-hour fire resistance.

1006.1.3 A stairway enclosure shall not be used for any purpose other than means of egress. Openings in exit enclosures other than unexposed exterior openings shall be limited to those necessary for exit access to the enclosure from normally occupiable or habitable rooms and for egress from the enclosure.

1006.1.3.1 Penetrations into and openings through a stairway enclosure assembly are prohibited except for required exit doors, ductwork and equipment necessary for independent stair pressurization, sprinkler piping, standpipes, and electrical conduit serving the stairway and terminating at a steel box not exceeding 16 sq in (0.010 m²). Such penetrations shall be protected in accordance with 705.4. There shall be no penetrations or communicating openings, whether protected or not, between adjacent stair enclosures.

1006.1.3.2 Exterior walls of an enclosed stairway shall comply with the requirements of Table 600 for exterior walls. Where nonrated walls or unprotected openings are used to enclose the exterior of the stairway, the building enclosure walls within 10 ft (3048 mm) horizontally of the nonrated wall or unprotected opening shall be constructed as required for stairway enclosures, including opening protective, but need not exceed 1-hour fire resistance with 3/4-hour opening protective. This construction shall extend vertically from the ground to a point 10 ft (3048 mm) above the topmost landing of the stairway or to the roof line, whichever is lower.

1006.1.4 The space under a stairway may be used if it is separated from the stairway by fire resistant construction as required by 1006.1.

Exception: Separation is not required from those stairways exempted from enclosure in 1006.1.1.

1006.2 Exterior exitway stairs

1006.2.1 Exterior stairways conforming to the requirements for interior stairways in all respects, except as to enclosures and except as herein specifically modified, may be accepted as an element of a required means of egress in buildings not exceeding five (5) stories or 55 ft (16.78 m) in height for other than Group E and I Unrestrained buildings.

1006.2.2 Exterior stairways shall be permitted where at least one door from each tenant opens onto a roofed-over open porch or balcony served by at least two stairways so located as to provide a choice of independent, unobstructed means of egress directly to the ground, except a single stairway shall be allowed when a single exit is permitted by 1020, 1025, 1026, and 1027. Such porches and stairways shall comply with the requirements for interior exitway stairways as specified in 1007 and 1014. Porches and balconies shall be not less than 4 1/2 ft (1372 mm) wide. The stairways shall be located so that the entrances and all portions of the stairways on each level are a distance apart equal to not less than one half of the length of the maximum overall diagonal dimension of the building or area to be served measured in a straight line between such stairways. The maximum travel distance from any tenant space to the nearest stairway shall be as specified in Table 1004. Porches and stairways shall be located at least 10 ft (3048 mm) from adjacent property lines and from other buildings on the same lot, unless openings in such buildings are protected by 3/4-hour fire resistant doors or windows.

1006.2.3 Handrails and guardrails shall be as specified in 1007.5 and 1015 respectively.

1006.2.4 Exterior stairs shall be separated from the interior of the building by walls with a fire resistance rating of not less than 1 hour, with fixed or self-closing opening protectives as required for enclosed stairs. This protection shall extend vertically from the ground to a point 10 ft (3048 mm) above the topmost landing or the roof line, whichever is lower, and horizontally 10 ft (3048 mm) from each side of the stairway. Openings within the 10 ft (3048 mm) horizontal extension of the protected walls beyond the stairway shall be equipped with fixed 3/4-hour assemblies.
Exceptions:
1. Exterior stairways may be unprotected when serving an exterior exit access balcony which has two exterior stairways, remotely located as required in 1006.2.2.
2. Such protection is not required in two-story buildings where there is a second exit remotely located as required in 1006.2.2.

1006.2.5 All required exterior stairways shall be located so as to lead directly to a street or open space with direct access to a street. When located on the rear of the building such stairways may lead through a passageway at grade complying with 1010.

1006.2.6 Exterior stairways shall not project beyond the street lot line.

SECTION 1007  STAIRWAY CONSTRUCTION

1007.1 General
1007.1.1 Exterior and interior exit stairways shall be constructed of noncombustible materials throughout in the following buildings:
1. All buildings of Type I and of Type II construction.
2. All Group A-1 and Group I buildings.
3. All other buildings three stories or more in height or occupied by more than 40 persons above or below the level of exit discharge.

Exception to item 3: R3 occupancies and buildings of Type VI construction.

1007.1.2 Stairways located in a required fire resistant enclosure shall have closed risers. All other stairways shall be permitted to have open risers.

1007.1.3 Interior stairs constructed of wood, except those with open risers, shall be fireblocked as specified in 705.3.

1007.1.4 Closets shall not be located beneath stairs unless such stairs are protected as required by 1006.1.

Exception: Protection is not required for those stair ways exempted from enclosure in 1006.1.1.

1007.1.5 The underside of interior stairways, if of combustible construction, shall be protected to provide not less than 1-hour fire resistance.

Exception: When located within a dwelling unit.

1007.1.6 Enclosed exit stairways that continue beyond the floor of discharge shall be interrupted at the floor of discharge by partitions, doors or other effective means.

Exception: Stairs that continue one-half story beyond the level of exit discharge need not be interrupted by physical barriers where the exit discharge is clearly obvious.

1007.2 For definitions, see Chapter 2.

1007.3 Treads and risers
1007.3.1 Treads and risers of stairs shall be so proportioned that the sum of two risers and a tread, exclusive of projection of nosing, is not less than 24 inches (610 mm) nor more than 25 inches (635 mm). The height of risers shall not exceed 7 3/4 inches (197 mm), and treads, exclusive of nosing, shall be not less than 9 inches (229 mm) wide.

Exception: Special stairs in 1007.8.

1007.3.2 Every tread less than 10 inches (254 mm) wide shall have a nosing, or effective projection, of approximately 1 inch (25.4 mm) over the level immediately below that tread.

1007.3.3 Tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge.

Exception: Tread depth of special stairs in 1007.8 shall be measured on a line perpendicular to the centerline of tread.

1007.3.4 Treads shall be of uniform depth and risers of uniform height in any stairway between two floors. There shall be no variation exceeding 3/16 inch (4.8 mm) in the depth of adjacent treads or in the height of adjacent risers and the tolerance between the largest and smallest riser or between the largest and smallest tread shall not exceed 3/8 inch (9.5 mm) in any flight. The uniformity of winders and other tapered treads, complying with 1007.8.1, 1007.8.2, and 1007.8.3 shall be measured at consistent distances from the narrower end of the treads.

Exception: Where the bottom or top riser adjoins a sloping public way, walk or driveway having an established grade and serving as a landing, a variation in height of the riser of not more than 3 inches (76 mm) for every 3 ft (914 mm) of stairway width is permitted.

1007.4 Landings
1007.4.1 A flight of stairs shall not have a vertical rise of more than 12 ft (3658 mm) between floors or landings,

1007.4.2 The width of landings shall be not less than the width of stairways they serve. Every landing shall have a minimum dimension measured in the direction of travel equal to the width of the stairway. Such dimension need not exceed 4 ft (1219 mm) when the stair has a straight run.

1007.4.3 Stairway landings shall have guardrails as specified in 1015 on any open and unenclosed edges.
construction having a fire resistance rating not less than that required for the exit enclosure, and
3. The area is protected throughout by an approved automatic sprinkler system, and
4. Any other portion of the level of discharge with access to the area of discharge is protected throughout by an approved automatic sprinkler system or separated from the area of discharge in accordance with the requirements for the enclosure of exitways.

**1010.4 Vestibules.** An exit may discharge into an interior vestibule which meets the following criteria:
1. The depth from the exterior of the building is not greater than 10 ft (3048 mm) and the length is not greater than 20 ft (6096 mm), and
2. The vestibule is separated from the remainder of the level of exit discharge by construction providing protection equivalent to that provided by 1/4-inch (6 mm) thick labeled wired glass in steel frames.

**SECTION 1011 FIRE ESCAPES**

**1011.1 General**

**1011.1.1** Fire escapes shall not be permitted except as approved by the building official for existing buildings when more adequate exit facilities cannot be provided. Fire escapes shall not provide more than 50% of the required exit capacity.

**1011.1.2** When located on the front of the building and projecting beyond the building line, the lowest landing shall be not less than 7 (2134 mm) nor more than 12 ft (3658 mm) above grade, equipped with a counterbalanced stairway to the street. In alleyways and thoroughfares less than 30 ft (9144 mm) wide, the clearance under the lowest landing shall be not less than 12 ft (3658 mm).

**1011.2 Design**

**1011.2.1** The fire escape shall be designed to support a live load of 100 psf (4.8 kPa) and shall be constructed of steel or other approved noncombustible materials. Fire escapes may be constructed of wood not less than 2 inches (51 mm) thick on buildings of Type VI construction.

**1011.2.2** Stairs shall be at least 22 inches (559 mm) wide with risers not more and treads not less than 8 inches (203 mm) and with landings at foot of stairs not less than 40 inches (1016 mm) wide by 36 inches (914 mm) long, located not more than 8 inches (203 mm) below the access window or door.

**1011.2.3** All openings located within 10 ft (3048 mm) of fire escapes shall be protected with approved opening protectives of at least 3/4-hour fire resistance.

**SECTION 1012 DOORS**

**1012.1 General**

**1012.1.1** Egress doors used as an exit door shall provide a clear opening of not less than the widths shown in Table 1004. The maximum leaf width of the door shall not exceed 48 inches (1219 mm). Egress doors used in the exit access shall provide a clear opening of not less than 32 inches (813 mm) wide.

**Exceptions:**
1. Resident sleeping room doors within Group I Restrained occupancies.
2. Storage closets less than 10 sq ft (0.93 m²) in area.
3. Revolving doors.
4. Interior egress door within a dwelling unit which is not required to be accessible.

**1012.1.2** Egress doors shall be side swinging type. Doors shall swing in the direction of egress for the following:
1. when serving an occupant load of 50 or more, or,
2. when serving a high hazard occupancy.

The following prescribed maximum forces applied to the latch side shall perform their respective functions:
1. A 15 lb (67 N) force shall release a latch.
2. A 30 lb (133 N) force shall set door in motion.
3. A 15 lb (67 N) force shall swing door fully open.

**Exceptions to 1012.1.2:**
1. As permitted for specific occupancies in 1018.
2. Revolving doors conforming with 1012.3.
3. Horizontal sliding doors conforming with 10 12.4 when used in elevator lobbies, or areas of refuge set forth in 1004.3.5, or horizontal exits, or smoke barriers, or any room or space, other than Group H, with an occupant load of less than 50.
1012.1.3 The floor surface on both sides of a door shall be at the same elevation. The floor surface or landing on each side of the door shall extend from the door in the closed position a distance equal to the door width.

Exceptions:
1. Variations in elevation due to differences in finish materials, but not more than 1/2 inch (12.7 mm).
2. Exterior decks, patios, or balconies that are part of Type B dwelling 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 dwelling unit.

1012.1.4 Thresholds at doorways shall not exceed 3/4 inch (19.1 mm) in height for exterior sliding doors serving dwelling units or 1/2 inch (12.7 mm) for other doors. Raised thresholds and floor level changes greater than 1/4 inch (6.4 mm) at doorways shall be beveled with a slope no greater than 1:2.

Exception: Exterior doors not on an accessible route as defined in 202.

1012.1.5 Doors opening onto exit stairs or other approved exits shall not obstruct the travel along any required exit. Doors opening onto exit access corridors or onto a landing shall not reduce the corridor width or the landing width to less than one-half the required width during the opening process. When fully open, the door shall not project more than 7 inches (178 mm) into the required width of a corridor or a landing.

1012.1.6 In Group R3 occupancies, a landing shall be provided on the exterior side of all egress door openings. Landing width shall be no less than the width of the door it serves and the depth shall be not less than 36 inches (914 mm). The landing may be one step lower than the inside floor level but not more than 7 inches (178 mm) lower.

1012.1.7 Door handles, pulls, latches, locks and other operating devices shall be capable of operating with one hand and shall not require tight grasping, tight pinching, or twisting of the wrist to operate.

Exceptions:
1. Doors within or serving a single dwelling unit not required to be accessible by 1105.4.2.
2. Doors within Type B dwelling units.

1012.1.8 Required exit doors shall be openable from the inside without the use of a key, tool, special knowledge or effort. Manually operated flush bolts or surface bolts are prohibited. All hardware must be direct acting requiring no more than one operation. Double cylinder dead bolts, requiring a key for operation on both sides, are prohibited on required means of egress doors unless the locking device is provided with a key which cannot be removed when the door is locked from the inside.

1012.1.9 Door handles, pulls, latches, locks and other operating devices shall be at 34 inches (864 mm) minimum and 48 inches (1219 mm) maximum.

Exception: Locks used only for security purposes and not used for normal operation are permitted in any location.

1012.1.10 For required width of doorways serving exit stairways and the exit capacity of doorways, see 1003.2 and 1003.3.

1012.1.11 Special locking arrangements shall be permitted in accordance with 1012.6 for the applicable occupancy and 1018.

1012.2 Power operated doors
1012.2.1 Where required doors are operated by power which is activated by a photo-electric device, floor mat, wall switches or other approved device as well as doors with power assisted manual operation, the design, installation and maintenance shall be such that, in the event of power failure, the door may be manually opened to permit exit travel. These doors shall be openable as is required for other nonpower operable doors.

1012.2.2 Power operating sliding doors may be used provided the sliding leaf is equipped with an emergency swing (panic release) feature.

Exception: Horizontal sliding doors conforming with 1012.4.

1012.2.3 Power operated doors shall comply with ANSI/BHMA A156.10.

1012.3 Revolving doors
1012.3.1 Each revolving door shall be capable of collapsing into a book-fold position with parallel egress paths providing an aggregate width of 36 inches (914 mm).

1012.3.2 A revolving door shall not be located within 10 ft (3048 mm) of the foot of or top of stairs or escalators or the entrance or exit of a moving walk. A dispersal area shall be provided between the stairs or escalators or either end of the moving walk and the revolving doors.

1012.3.3 The turning speed of a revolving door shall not exceed the maximum permitted by Table 1012.3.3.

1012.3.4 Each revolving door shall have a conforming side-hinged swinging door in the same wall as the revolving door and within 10 ft (3048 mm).

Exception: A revolving door may be used without an adjacent swinging door for street floor elevator lobbies if a stairway, escalator or door from other parts of the building does not discharge through the lobby and the lobby does not have any occupancy or use other than as a means of travel between elevators and street.
### TABLE 1016
EMERGENCY POWER FOR EXIT SIGNS AND EMERGENCY LIGHTING

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<thead>
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<th>OCCUPANCY</th>
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<td>Greater than 150</td>
</tr>
<tr>
<td>Group E</td>
<td>Greater than 300</td>
</tr>
</tbody>
</table>

**Note:**
1. Individual rooms 500 sq ft (46.5 m²) or less in mixed occupancy and buildings 500 sq ft (46.5 m²) or less are exempted.
2. Special power complying with 1016.2 is required for Group R4 Large Facility occupancies.

### SECTION 1017
EXIT OBSTRUCTIONS

Where floor space is occupied by tables, chairs or other movable furniture, aisles not less than 36 inches (914 mm) clear width shall be maintained to provide ready access to egress doors.

### SECTION 1018
SPECIAL EGRESS REQUIREMENTS BY OCCUPANCY

The general requirements of Chapter 10 apply to all occupancies except as modified for specific occupancies in accordance with 1019 through 1027.

### SECTION 1019
ASSEMBLY

#### 1019.1 Means of egress capacity

1019.1.1 The minimum aggregate width of the main entrance for Group A occupancies shall be sufficient to accommodate 50% of the occupant load and shall be at the level of exit discharge or shall connect to a stairway or ramp leading to a street. Each level of a Group A occupancy shall have access to a main exit and shall be provided with additional exits of sufficient width to accommodate one-half of the total occupant load served by that level. Where the main exit from an assembly occupancy is through a lobby or foyer, the aggregate capacity of all exits from the lobby or foyer shall be permitted to provide the required capacity of the main exit regardless of whether all such exits serve as entrances to the building.

**Exception:** In assembly occupancies where there is no well-defined entrance, exits may be distributed around the perimeter of the building, provided the total exit width furnishes a minimum of 100 percent of the width needed to accommodate the maximum occupant content.

#### 1019.2 Foyers and lobbies

1019.2.1 In every Group A - Large Assembly occupancy, a foyer consisting of a space at a main entrance of the auditorium or place of assembly shall be provided. 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 passage to every such main entrance and exit.

1019.2.2 The width of a foyer at any point shall be not less than the combined width of aisles, stairways, and passageways tributary thereto.

1019.2.3 In theaters and similar Group A occupancies, where persons are admitted to the building at times when seats are not available and are allowed to wait in a lobby or similar space, such use of lobby or similar space shall not encroach upon the required clear width of exits. Such waiting areas shall be separated from the required exitways by substantial permanent partitions or by fixed rigid railings not less than 42 inches (1067 mm) high.

#### 1019.3 Interior balcony and gallery

1019.3.1 Means of egress. For balconies or galleries of Group A occupancies having a seating capacity of over 50, at least two means of egress shall be provided, one from each side of every balcony or gallery, leading directly to a street or exit court.

1019.3.2 Two means of egress shall be required from theater balconies when the occupancy exceeds 50.

1019.3.3 Enclosure and Capacity. All interior stairways and other vertical openings shall be enclosed and protected as provided in this chapter, except that stairs may be open between balcony and main assembly floor in occupancies such as theaters, churches and auditoriums. The means of egress capacity required for balconies or galleries shall be determined on the same basis as those required for the occupancy use.

1019.3.4 Travel Distance. The maximum travel distance for balcony or gallery from any seat to an exit shall be determined on the same basis as the building occupancy.

#### 1019.4 Stages

1019.4.1 Where two means of egress are required, they shall be separate with at least one means of egress on each side of the stage.

1019.4.2 The means of egress from lighting and access catwalks, galleries and gridirons shall meet the requirements for Group F occupancies.

**Exceptions:**
1. A minimum width of 22 inches (559 mm) shall be permitted for lighting and access catwalks.
2. A second means of egress is not required from these areas where a means of escape to a floor or to a roof is provided. Ladders, alternating tread stairs, or spiral stairs shall be permitted in the means of escape.
1019.4.3 Each tier of dressing rooms shall be provided with two exits.

1019.4.4 Stairways from stage and dressing rooms need not be enclosed.

1019.5 Tents. Tent exits, aisles, seating, etc., shall conform with the requirements for places of assembly. All exits shall be kept free and clear of obstructions while the tent is occupied by the public.

1019.6 Projection rooms. The projection room shall be provided with not less than one exit having a minimum opening of not less than 30 inches (762 mm) wide and 80 inches (2032 mm) high.

1019.7 Doors
1019.7.1 A key locking device may be used from the egress side on the main exterior exit doors on Group A-2 having an occupancy of 300 or less, subject to the following:
1. There is a readily visible durable sign on or adjacent to the door stating: THIS EXIT TO REMAIN UNLOCKED WHEN THIS BUILDING IS OCCUPIED. The sign shall be in letters no less than 1 inch (25.4 m) high on a contrasting background.
2. The locking device must be of a type that will be readily distinguishable as locked.
3. The main exit door is a single door or one pair of doors.
4. When unlocked, the door or both leaves of the pair must be free. The use of the key locking device may be revoked by the building official for due cause.

1019.7.2 Each door in a means of egress from an area of Group A occupancy may be provided with a latch or lock only if it is panic hardware or fire exit hardware, which releases when pressure of no more than 15 lb (67 N) is applied to the releasing devices in the direction of the exit travel. Such releasing devices may be bars or panels extending not less than one-half the width of the door and placed at heights suitable for the service required, but not less than 30 inches (762 mm) nor more than 44 inches (1118 mm) above the floor. Whenever panic hardware is used on a labeled fire door, the panic hardware shall be labeled as fire exit hardware.

1019.7.3 If balanced doors are used and panic hardware is required, the panic hardware shall be of the pushpad type and the pad shall not extend more than one-half the width of the door measured from the latch side.

1019.8 Stairway construction
1019.8.1 In buildings of Group A occupancy, flights of less than three risers shall not be used in interior or exterior stairways, exit passageways, aisles, at entrance or elsewhere in connection with required exits. To overcome lesser differences in level, ramps in accordance with 10 13 shall be used. See 1019.10 for additional aisle and stair information in assembly occupancies.

1019.9 Guardrails
See 10 19.9 for guardrail provisions.

1019.10 Assembly aisles and seating
1019.10.1 General
1019.10.1.1 Scope. Provisions in 1019.10 shall apply to all assembly aisles and seating except for special provisions relating to seating for reviewing stands, grandstands, and bleachers.

1019.10.1.2 Aisles Required. Every portion of any building which contains seats, tables, displays, equipment, or other material shall be provided with aisles leading to exits.

1019.10.1.3 Travel Distance. Exits and aisles shall be so located that the travel distance to an exit door shall not be greater than 200 ft (61 m) measured along the line of travel. Travel distance may be increased to 250 ft (76 m) in sprinklered buildings.

1019.10.1.4 Seats shall be securely fastened to the floor in assembly occupancies with occupant loads greater than 200, assembly occupancies used for theatrical or similar purposes or the display of motion pictures, and all balconies, galleries, boxes, or loges.

Exceptions:
1. Restaurants, cafeterias, cafeteriums, gymnasiums, gymatoriums, and similar multi-purposes assembly occupancies.
2. Movable seating in rows with seats fastened together in groups not less than three.
3. Seats in balconies, galleries, railed in enclosures, boxes, or loges with level floor surfaces and having occupant loads not exceeding 14.

1019.10.2 Aisle width
1019.10.2.1 Aisle width shall provide sufficient egress capacity for the number of persons accommodated by the catchment area served by the aisle. See 1019.10.4. The catchment area served by an aisle is that portion of the total space that is naturally 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.

1019.10.2.2 Where aisles converge to form a single path of egress travel, the required egress capacity of that path shall be not less than the combined required capacity of the converging aisles.

1019.10.2.3 Those portions of aisles, where egress is possible in either of two directions, shall be uniform in required width.
1403.5.8 Mechanical fastenings
1403.5.8.1 All thin exterior structural glass veneer installed above the level of the heads of snow windows and all such veneer installed more than 12 ft (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.

1403.5.8.2 Fastenings shall be secured to the wall or backing with expansion bolts, toggle bolts, or by other methods.

1403.5.8.3 Fastenings shall be so designed as to hold the glass veneer in a vertical plane independently of the mastic cement. Shelf angles providing both support and fastenings may be used.

1403.5.9 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.

1403.6 Wood
1403.6.1 Wood siding patterns known as rustic drop siding or shiplap shall have an average thickness in place of not less than 19/32 inch (15.1 mm) and shall have a minimum thickness of not less than 3/8 inch (9.5 mm). Bevel siding shall have a minimum thickness measured at the butt section of not less than 7/16 inch (11.1 mm) and a tip thickness of not less than 3/16 inch (4.8 mm). Siding of lesser dimensions may be used provided such wall covering is placed over sheathing which conforms to the provisions of 2308.2.

1403.6.2 Board siding applied vertically shall be nailed to horizontal nailing strips or blocking set 24 inches (610 mm) on center. The nails shall penetrate 1 1/2 inches (38 mm) into studs, blocking, studs or blocking and sheathing combined, or nailing strips.

1403.6.3 Wood shakes and shingles shall be applied in accordance with the CSSB Design and Application Manual for Exterior and Interior Walls.

1403.6.4 Wood structural panels shall be of the exterior type and shall have a thickness of 3/8 inch (9.5 mm), except as provided in Table 2308. 1 D. All wood structural panel joints shall be backed solidly with nailing pieces not less than 2 inches (51 mm) wide, unless wood, wood structural panel or particleboard sheathing is used, or otherwise made waterproof as required in 2303.3.

Exception: The framework is not required to be protected in accordance with 2303.3 when the joints are protected by a continuous wood batt, caulking, flashing or vertical or horizontal shiplap.

1403.6.5 Hardboard siding shall conform with the requirements of ANSI/AHA A 135.6 and shall be identified as to classification.

1403.6.6 Particleboard siding used for covering the exterior of outside walls shall be of M-S Exterior Glue grade conforming to ANSI A208.1. Particleboard panel siding shall be installed in accordance with Table 2306.1 and Table 1403.6. Nails shall be spaced not less than 3/8 inch (9.5 mm) from edges and ends. Joints shall occur over framing members unless particleboard panel siding is applied over 5/8-inch (15.9 mm) net wood sheathing or 15/32-inch (11.9 mm) wood structural panels or 1/2-inch (12.7 mm) particleboard sheathing. The framework shall be protected as required in 2303.3.

Exception: The framework is not required to be protected in accordance with 2303.3 when the joints are protected with a continuous wood batt, caulking, flashing or vertical or horizontal shiplap.

1403.6.7 Wood veneers on exterior wall panels of Types I, II, III, IV, and V construction shall comply with 1403.6.7.1 and 1403.6.7.2.

<p>| TABLE 1403.6 ALLOWABLE SPANS FOR EXPOSED PARTICLEBOARD PANEL SIDING |
| MINIMUM THICKNESS (inches) |</p>
<table>
<thead>
<tr>
<th>GRADE</th>
<th>Stud Spacing (inch)</th>
<th>Siding Direct to Studs</th>
<th>Siding Continuous Support</th>
<th>Exterior Ceilings and Soffits Direct to Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-S Exterior Glue</td>
<td>16</td>
<td>5/8</td>
<td>3/8</td>
<td>3/8</td>
</tr>
<tr>
<td>24</td>
<td>3/4</td>
<td>3/8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For SI: 1 in = 25.4 mm.

1403.6.7.1 Wood veneers of not less than 1-inch (25.4 mm) nominal thickness, 7/16-inch (11.1mm) exterior hardboard siding or 3/8-inch (9.5 mm) exterior type wood structural panels or particleboard may be used on exterior walls when all the following conditions are met:
1. The wall to which the veneer is attached faces a street or permanent open space of 30 ft (9144 mm) or more wide.
2. The veneer does not exceed two stories in height, measured from grade, except where fire retardant treated for exterior use, it may be four stories in height.
3. The veneer is attached to or furred from a non-combustible backing of the fire resistance required by other provisions of this chapter.
4. 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.
Where the wood veneer is furred from the wall and forms a solid surface, the distance between the back of the veneer and the wall shall not exceed 1 5/8 inch (41 mm) and the space thereby created shall be fireblocked in accordance with 2305 and arranged so that there will be no open space exceeding 100 sq ft (9.3 m²). Where wood furring strips are used, they shall be of approved wood of natural decay resistance or preservative-treated wood.

1403.7 Asbestos shingles. Asbestos shingles attached to sheathing other than wood, or wood structural panels shall be secured with approved mechanically bonding nails or by corrosion-resistant common nails on shingle nailing boards securely nailed to each stud with two 8d nails, except that asbestos shingles may be attached directly to fiberboard nail base sheathing with corrosion-resistant annular grooved nails. Asbestos shingles shall have a minimum thickness of 5/32 inch (4 mm).

1403.8 Stucco. Stucco or exterior plaster shall conform to requirements of 2504.

1403.9 Rigid vinyl

1403.9.1 Vinyl siding conforming to the requirements of this section and complying with ASTM D 3679 shall be permitted on exterior walls as cladding of buildings of type V construction and not more than two stories in height. The siding shall be fastened to the wall to conform to the wind load requirements of Chapter 16 and must be supported with tests and calculations.

1403.9.2 Application. The siding shall be applied over sheathing or materials listed in section 2304.6. siding shall conform to water resistant barrier requirements in section 1403. siding and accessories shall be installed in accordance with approved manufacture’s instructions. Fasteners shall be corrosion resistant and spacing shall not exceed 16 inches horizontally and 12 inches vertically.

1403.9.3 Provisions for exterior plastic veneers other than rigid vinyl are found in 2604.9.

SECTION 1404
ARCHITECTURAL TRIM, BALCONIES, BAY WINDOWS

1404.1 Architectural trim

1404.1.1 Architectural trim on buildings of Type I, II and IV construction not more than three stories or 40 ft (12.2 m) high may be of Type VI construction, and may be of Type VI construction on all buildings of Type III, V, and VI construction. Trim shall be secured to the wall with metal or other approved brackets or fasteners. When architectural trim is located along the top of exterior walls, it shall be completely backed by the exterior wall and shall not extend over the top of exterior walls.

1404.1.2 For projection over public property, see 3206.

1404.2 Balconies and bay windows. Balconies not used as required exits and bay windows shall conform to the type of construction required for the building to which they are attached, except that exterior fire retardant treated wood is permitted on buildings three stories or less for Type I and II exterior walls.

1404.3 Combustible projections. Combustible projections from walls located where protection of openings is required shall be 1-hour fire resistant or heavy timber construction. Projections shall not extend more than 12 inches (305 mm) into the areas where openings are prohibited.

SECTION 1405
FIRE DEPARTMENT ACCESS IN EXTERIOR WALLS

1405.1 General. Exterior walls shall have access openings for fire department use serving each story above grade on an accessible side of the building up to a height of 75 ft (22.9 m). Such access openings shall be a minimum of 32 inches (813 mm) wide and 48 inches (1219 mm) high and with the bottom of the opening not more than 32 inches (813 mm) above the floor.

Exception: Fire department access to high-piled combustible storage and high-rack storage systems shall be in accordance with Chapter 36 of the Standard Fire Prevention Code.

1405.2 Spacing. Openings shall be so spaced that there will be one opening in each 50 ft (15.2 m) of exterior wall on an accessible side of the building.

Exception: Buildings equipped with an automatic sprinkler system throughout in accordance with NFPA 13 shall have access panels as set forth for each 200 ft (61 m) of wall.

1405.3 Identification. Where complying access openings are not apparent, they shall have distinctive markings for identification.

1405.4 Obstructions. Access openings shall open into a fire aisle within the building and no shelving, loose or fixed, no containers or equipment of any description, nor any loose merchandise shall be placed so as to block aisleways.
SECTION 1507
ROOF COVERINGS WITH SLOPES
2:12 OR GREATER

1507.1 Scope. This section regulates the installation of roof coverings installed on roof slopes of 2:12 or greater.

1507.2 Roof covering application. Roof coverings shall be applied in accordance with the applicable provisions of 1507 and the manufacturer's installation instructions.

1507.3 Asphalt shingles. The installation of asphalt shingles shall comply with the provisions of 1507.3.

1507.3.1 Deck requirements. Asphalt shingles shall be fastened to solidly sheathed decks.

1507.3.2 Slope. Asphalt shingles shall only be used on roof slopes of 2:12 or greater. For roof slopes from 2:12 up to 4:12, double underlayment application is required in accordance with 1507.3.8.

1507.3.3 Underlayment. Unless otherwise noted, required underlayment shall conform with ASTM D 226, Type 1, or ASTM D 4869, Type 1.

1507.3.4 Self-adhering polymer modified bitumen sheet. Self-adhering polymer modified bitumen sheet shall comply with ASTM D 1970.

1507.3.5 Asphalt Shingles. Asphalt shingles shall have self-seal strips or be interlocking, and comply with ASTM D 225 or ASTM D 3462.

1507.3.6 Fasteners. Fasteners for asphalt shingles shall be galvanized, stainless steel, aluminum, or copper roofing nails, minimum 12 gauge 10.105 inch (2.67 mm) Shank with a minimum 3/8 inch (9.5 mm) diameter head, of a length to penetrate through the roofing materials and a minimum of 3/4 inch (19 mm) into the roof sheathing. Where the roof sheathing is less than 3/4 inch (19 mm) thick, the nails shall penetrate through the sheathing.

1507.3.7 Attachment. Asphalt shingles shall be secured to the roof with not less than four fasteners per strip shingle or two fasteners per individual shingle. Where the roof slope exceeds 20 units vertical in 12 units horizontal (20:12), special methods of fastening are required. For roofs located where the basic fastest mile wind speed per Figure 1606 is 90 mph or greater, special methods of fastening are required.

1507.3.8 Underlayment application

1507.3.8.1 For roof slopes from 2:12 up to 4:12, 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 to stay in place.
2. Starting at the eave, 36-inch-wide (914 mm) strips of underlayment felt shall be applied over-lapping successive sheets 19 inches (483 mm) and fastened sufficiently to stay in place.

1507.3.8.2 For roof slopes 4:12 or greater, underlayment shall be a minimum of one layer of underlayment felt applied as follows: starting at the eave, underlayment shall be applied shingle fashion parallel to the eave, lapped 2 inches (51 mm), and fastened sufficiently to stay in place.

1507.3.9 Flashings. Flashing for asphalt shingles shall comply with 1507.3.9.

1507.3.9.1 Base and cap flashing. Base and cap flashing shall be installed in accordance with manufacturer's installation instructions. Base flashing shall be of either corrosion-resistant metal of minimum nominal 0.019 inch (0.483 mm) thickness or mineral surface roll roofing weighing a minimum of 77 lbs per 100 sq ft (3.76 kg/m²). Cap flashing shall be corrosion resistant metal of minimum nominal 0.19 inch (0.483 mm) thickness.

1507.3.9.2 Valleys. Valley linings shall be installed in accordance with manufacturer's installation instructions before applying asphalt 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 16 inches (406 mm) wide and of any of the corrosion -resistant metals in Table 1507.3.9.2.
2. For open valleys, valley lining of two plies of mineral surface roll roofing 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 (valley covered with shingles), valley lining shall be one of the following:
   1. Both types 1 and 2 above, combined
   2. One ply of smooth roll roofing at least 36 inches wide (914 mm) and complying with ASTM D 224
   3. Specialty underlayment at least 36 inches wide (914 mm) and complying with ASTM D 1970.
**TABLE 1507.3.9.2 VALLEY LINING MATERIAL**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>MINIMUM THICKNESS</th>
<th>GAGE</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td></td>
<td></td>
<td>16 oz</td>
</tr>
<tr>
<td>Aluminum</td>
<td>0.024 in.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stainless Steel</td>
<td></td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Galvanized Steel</td>
<td>0.0179 in.</td>
<td>26 (zinc coated G90)</td>
<td></td>
</tr>
<tr>
<td>Zinc Alloy</td>
<td>0.027 in.</td>
<td></td>
<td>2 1/2 pounds</td>
</tr>
<tr>
<td>Lead Painted Terne</td>
<td></td>
<td>20 pounds</td>
<td></td>
</tr>
</tbody>
</table>

**1507.3.9.3 Drip edge.** Drip edge shall be provided at eaves and gables of shingle roofs, and overlapped a minimum of 2 inches (51 mm). Eave drip edges shall extend 1/4 inch (6.4 trim) below sheathing and extend back on the roof a minimum of 2 inches (51 mm). Drip edge shall be mechanically fastened a maximum of 12 inches (305 mm) on center.

**1507.3.9.4 Crickets or Saddles** A cricket or saddle shall be installed on the ridge side of any chimney greater than 30 inches (762 mm) wide. Cricket or saddle coverings shall be sheet metal or of the same material as the roof covering.

**1507.4 Clay and concrete tile.**

**1507.4.1** The installation of clay and concrete tile shall comply with the provisions of 1507.4.

**1507.4.1.1 Marking.** Each roof tile shall have a permanent manufacturer's identification mark.

**1507.4.1.2 Application specifications.** The tile manufacturer's written application specifications shall be available and shall include but not be limited to the following:

1. The tile's placement and spacing,
2. Attachment system necessary to comply with Chapter 16,
   1. Amount and placement of mortar,
   2. Amount and placement of adhesive,
   3. Type, number, size, and length of fasteners and clips,
3. Underlayment,
4. Slope requirement.

**1507.4.2 Decks**

**1507.4.2.1 Deck requirements.** Concrete and clay tile shall be installed only over solid sheathing or spaced structural sheathing boards.

**1507.4.2.2 Deck slope.** Clay and concrete roof tile shall be installed on roof slopes of 2 1/2:12 or greater. For roof slopes from 2 1/2:12 to 4:12, double underlayment application is required in accordance with 1507.4.3.

**1507.4.3 Underlayment.** Unless otherwise noted, required underlayment shall conform with ASTM D 226, Type II; ASTM D 2626, Type I; or ASTM D 249 mineral surfaced roll roofing.

**1507.4.3.1 Low slope roofs.** For roof slopes from 2 1/2:12 up to 4:12, 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 to stay in place.
2. Starting at the eave, 36-inch-wide (914 mm) strips of underlayment felt shall be applied overlapping successive sheets 19 inches and fastened sufficiently to stay in place.

**1507.4.3.2 High slope roofs.** For roof slopes of 4:12 or greater, underlayment shall be a minimum of one layer of underlayment felt applied as follows: starting at the eave, underlayment shall be applied shingle fashion, parallel to the eave, lapped 2 inches (51 mm) and fastened sufficiently to stay in place.

**1507.4.4 Application Standards.** Clay and concrete tile shall be applied in accordance with the manufacturer's installation instructions or recommendations of the FRSA/NTRMA 07320.

**1507.4.5 Clay tile.**

**1507.4.5.1 Clay tile.** Clay roof tile shall comply with ASTM C 1167.

**1507.4.5.2 Concrete Tile.**

**1507.4.5.2.1 Roof tile shall be in accordance with the physical test requirements as follows:**

1. The transverse breaking strength of tiles shall be determined according to Section 5.3 of ASTM C 1167, and in accordance with Table 1507.4.5.2.1.
2. The absorption of concrete roof tiles shall be according to Section 8 of ASTM C 140. Roof tiles shall absorb not more than 12% of the dry weight of the tile during a 24-hour immersion test.
3. Roof tiles shall be tested for freeze/thaw resistance according to Section 8 of ASTM C 67. Roof tiles shall show no breakage and not have more than 1% loss in dry weight of any individual concrete roof tile.
2. Floors in garages or portions of buildings used for the storage of motor vehicles shall be designed for the uniformly distributed live loads of Table 1604.1 or the following concentrated loads: (1) for passenger cars accommodating not more than nine passengers, 2,000 lb acting on an area of 20 sq in; (2) mechanical parking structures without slab or deck, passenger cars only, 1,500 lb per wheel; (3) for trucks or buses, maximum wheel load on an area of 20 sq in.

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

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

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

1604.6 Roof live loads

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

| TABLE 1604.6 MINIMUM ROOF LIVE LOAD (LBS PER SQ FT OF HORIZONTAL PROJECTION) |
|----------------------------------|---------|---------|---------|
| ROOF SLOPE                       | FOR ANY STRUCTURAL MEMBER |
| TRIBUTARY LOADED AREA (SO FT)    | 0 to 200 | 201 to 600 | Over 600 |
| Flat or rise less than 4-in per ft | 16      |          |          |
| Arch or dome with rise less than 1/8 of span | 20      | 16      | 12      |
| Rise 4 in per ft to less than 12 in per ft |          |          |          |
| Arch or dome with rise 1/8 of span to less than 3/8 of span | 14      | 12      | 12      |
| Rise 12 in per ft and greater |          |          |          |
| Arch or dome with rise 3/8 of span or greater | 12      | 12      | 12      |
| Awnings except cloth covered | 5        | 5        | 5        |
| Greenhouses, lath houses and agricultural buildings | 10      | 10      | 10      |

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

1604.6.2 Rain loads shall be designed for in accordance with the following:

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

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

1604.6.5 Wind loads shall comply with the provisions of 1606.

1604.7 Impact loads

1604.7.1 For structures carrying live loads which induce unusual impact, the assumed live load shall be increased sufficiently to provide for same. If not otherwise specified, the increase shall be:

- 1. For supports of elevators ................................. 100%
- 2. For cab operated traveling crane support girders and their connections* ................................. 25%
- 3. For pendant operated traveling crane support girders and their connections* ................................. 10%
- 4. For supports of light machinery, shaft or motor driven, not less than ................................. 20%
- 5. For supports of reciprocating machinery or power-driven units, not less than ................................. 50%
- 6. For hangers supporting floors and balconies 33%

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

1604.7.2 The lateral force on crane runways to provide for the effect of moving crane trolleys shall, if not otherwise specified, be 20% of the sum of the weights of the lifted load and of the crane trolley exclusive of other parts of the crane. The force shall be assumed to be applied at the top
of the rails acting in either direction normal to the runway rails and shall be distributed with due regard for lateral stiffness of the structure supporting these rails. The longitudinal force shall, if not otherwise specified, be taken as 10% of the maximum wheel loads of the crane applied at the top of the rail.

1604.8 Supports for walkway. Where walkways are to be installed above ceilings, supports shall be designed to carry a load of 200 lb (890 N) occupying a space 2 1/2 sq ft (0.23 m²), so placed as to produce maximum stresses in the affected members.

1604.9 Sidewalks. Sidewalks shall be designed to carry either a uniformly distributed load of 200 psf (9.6 kPa) or a concentrated load of 8,000 lb (35.6 kN) on a space 2 1/2 sq ft (0.58 m²) and placed in any position, whichever will produce the greater stresses. This does not apply to sidewalks on grade.

SECTION 1606
WIND LOADS

1606.1 Applications. All buildings, structures and parts thereof shall be designed to withstand the appropriate wind loads prescribed herein. Decreases in wind loads shall not be made for the effect of shielding by other structures. Wind pressures shall be assumed to act normal to the surfaces considered.

1606.1.1 Determination of wind forces. Wind forces on every building or structure shall be determined by the provisions of ASCE 7 using the fastest mile wind velocity of 110 m.p.h. and exposure D Category.

Exceptions:
1. Provisions of 1606.2 shall be permitted for buildings 60 ft (18.3 m) high or less.
2. Provisions of S13CC1 SSTD 10 shall be permitted for applicable Group R2 and R3 buildings.

1606.1.2 Limitations
1606.1.2.1 Mixing of provisions from ASCE 7 and 1606.2 shall not be permitted.

1606.1.2.2 Provisions of 1606.2 do not apply to buildings or structures having unusual geometric shapes, response characteristics or site locations for which channeling effects or buffeting in the wake of upwind obstructions may warrant special consideration. For these cases, wind loads shall be based on wind tunnel tests or nationally recognized data.

1606.2 Buildings 60 feet high or less
1606.2.1 Scope. Procedures in 1606.2 shall be used for determining and applying wind pressures in the design of buildings with flat, single sloped, hipped and gables shaped roofs whose mean roof heights exceed neither 60 ft (18.3 m) nor the least horizontal dimension of the building.

1606.2.2 Wind pressures
1606.2.2.1 Structural members, cladding, fasteners and systems providing for the structural integrity of the building shall be designed for the velocity pressures from Table 1606.2A using Figure 1606, multiplied by the appropriate pressure coefficient from Tables 1606.213 and 1606.2C and Figures 1606.2C to 1606.2E and by the appropriate use factor from Table 1606. Coefficients given in 1606.2 include a gust factor and thus do not correspond to coefficients used in many other sources. Mixing of coefficients and dynamic pressures from different sources shall not be permitted.

<table>
<thead>
<tr>
<th>TABLE 1606</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE FACTORS FOR BUILDINGS AND OTHER STRUCTURES</td>
</tr>
<tr>
<td>NATURE OF OCCUPANCY</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>All buildings and structures except those listed below</td>
</tr>
<tr>
<td>Buildings and structures where the occupant load is 300 or more in any one room.</td>
</tr>
<tr>
<td>Buildings and structures designated as essential facilities, including, but not limited to:</td>
</tr>
<tr>
<td>(1) Hospital and other medical facilities having surgery or emergency treatment areas</td>
</tr>
<tr>
<td>(2) Fire or rescue and police stations</td>
</tr>
<tr>
<td>(3) Primary communication facilities and disaster operation centers</td>
</tr>
<tr>
<td>(4) Power stations and other utilities required in an emergency</td>
</tr>
<tr>
<td>Buildings and structures that represent a low hazard to human life in the event of failure, such as agricultural buildings, certain temporary facilities, and minor storage facilities</td>
</tr>
</tbody>
</table>

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

1606.2.23 No part (component, cladding or fastener) of a building shall be designed for less than 10 psf (479 Pa) acting in either direction normal to the surface.
NOTES:
1. VALUES ARE FASTEST MILE SPEED AT 33 FT (10M) ABOVE GROUND

FIGURE 1606
BASIC WIND SPEED
The wind load used in the design of the main wind force resisting system for buildings shall not be less than 10 psf multiplied by the area of the building projected on a vertical plane that is perpendicular to the wind direction.

Definitions. For definitions, see Chapter 2.

Main wind force resisting system (MWFRS). Pressure coefficients GCp for all wind loading actions arising from combining loads acting simultaneously on more than one surface shall be determined by 1606.2.4.

End zones. The width of 'X' end zones as shown in Figures 1606.2BI and 1606.2B2 shall be twice the value of "Z" determined in 1606.2.5.1. For framed buildings whose end bay spacings are greater than or equal to 'X' the difference in end zone and interior zone loading can be allocated entirely to the end frame.

Applicability of coefficients. Pressure coefficient GCp for the main wind force resisting system shall be taken from Tables 1606.2B or 1606.2C and applied with consideration for the torsional effect in each individual load case, as shown in Figures 1606.2B1 and 1606.2B2 and as specified in 1606.2.2. Where more than one load case exists, buildings shall be designed for all load cases.

Overhang coefficients. The pressure coefficients GC P to be used for the effects of roof overhangs on MWFRS for each of the load cases and windward and leeward surfaces shall be as indicated in Table 1606.21). Roof overhang members shall be designed in accordance with 1606.2.5.

Components and cladding. Pressure coefficients GCp for wind loading actions on components and cladding shall be determined from Figures 1606.2C, 1606.2D and 1606.2E, based on effective wind area.

Edge strips. The width of the edge strips "Z" for walls and roofs shall be determined by the smaller of 10% of the least horizontal dimension of the building or 40% of the eave height, but not less than the larger of 4% of the least horizontal dimension of the building or 3 ft (914 mm).

Walls.
1. Pressure coefficients GC for components and cladding of walls shall be taken from Figure 1606.2C according to their effective wind areas and applied to the corresponding regions of the building as shown in Figure 1606.2C.
2. Coefficients taken from Figure 1606.2C may be reduced 10% if the angle of the roof is no greater than 10 degrees.

Gable and hip roofs. Pressure coefficients GC p for components and cladding or roofs shall be taken from Figure 1606.21) and 1606.2E. Pressure coefficients for roof angles greater than 45 degree (0.785 rad) shall be based on nationally recognized data.

Monoslope roofs. Pressure coefficients GCP for monoslope roofs shall be taken from Figure 1606.21) for roof slopes between 0 degrees and 3 degrees (0 and 0.052 rad), and from Figures 1606.2F and 1606.2G for roof slopes greater than 3 degrees (0.052 rad).

Wind loads for simple diaphragm buildings. Wind load design of enclosed buildings meeting the definition of a Simple Diaphragm Building shall be permitted in accordance with this section. Structural members, cladding, fasteners and systems providing for the structural integrity of the building shall be designed for the velocity pressures from Table 1606.2A using Figure 1606, multiplied by the appropriate pressure coefficient from Table 1606.2E and Figures 1606.2C to 1606.2E and by the appropriate use factor from Table 1606.

Main wind force resisting system. All elements and connections of the main wind force resisting system shall be designed for vertical and horizontal loads shown in Figure 1606.2B3, and based on the combined leeward and windward wall and roof coefficients GC as given in Table 1606.2E. The design wind load shadbe applied nonconcurrently to each major axis of the structure. The width of the end zone shall be determined from 1606.2.4. 1. End zones shall be arranged as shown in Figures 1606.2B 1 and 1606.2B2.

Wall elements subjected to wind loads which also support roof framing members shall be considered part of the main wind force resisting system. These elements shall be designed for the interaction of vertical and horizontal wind loads or have independent resistance mechanisms for vertical load and horizontal load. The horizontal load shall be based on GC P = + 0.95 for end zones and GCP = ± 0.70 for interior zones.

Components and cladding. All wall and roof framing including cladding and connections of these elements shall be designed using pressure coefficients GCP determined from Figures 1606.2C, 1606.213, and 1606.2E.

Roof systems

Roof deck. The roof deck shall be designed to withstand the wind pressures determined under 1606.2 for buildings 60 ft (18.3 m) or less in height or ASCE 7 for buildings of any height.
### 1606.3.2 Roof coverings

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

### 1606.3.3 Rigid tile

Wind loads on rigid tile roof coverings shall be determined as the lifting moment \( M_a \). The lifting moment shall be determined in accordance with the following formula:

\[
M_a = q_h C_L b L_a [1.0 - GC_p]
\]

where:
- \( M_a \) = aerodynamic uplift moment (ft-lb) acting to raise the tail of the tile.
- \( q_h \) = wind velocity pressure (psf) determined from Table 1606.2A.
- \( C_L \) = lift coefficient determined from Table 1606.3.3 or by testing in accordance with 1707.5.
- \( b \) = exposed width (ft) of the roof tile.
- \( L \) = length (ft) of the roof tile.
- \( L_a \) = moment arm (ft) from the axis of rotation to the point of uplift on the roof tile. The point of uplift shall be taken at 0.76 \( L \) from the head of the tile and the middle of the exposed width. For roof tiles with nails or screws (with or without a tail clip), the axis of rotation shall be taken as the head of the tile for direct deck applications and as the top edge of the batten for batten 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.
- \( GC_p \) = roof coefficient for each applicable zone determined from Figure 1606.2E. Roof coefficient shall not be adjusted for internal pressure.

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

1. The roof tiles shall be either loose laid on battens or mechanically fastened or mortar set or adhesive set.
2. The roof tiles shall be installed on solid sheathing which has been designed as components and cladding in accordance with 1606.2.3.3.
3. An underlayment shall be installed in accordance with 1507.4.
4. The tile shall be single lapped interlocking with a minimum head lap of not less than 2 inches (51 mm). The length of the tile shall be between 1.0 and 1.75 ft (305 and 533 mm).
5. The length of the tile shall be between 0.67 and 1.25 ft (203 and 381 mm).
6. Maximum thickness of the tail of the roof tile shall not exceed 1.3 inches (33 mm).
7. Roof tiles using mortar set or adhesive set systems shall have at least 2/3 of the tile's area free of mortar or adhesive contact.

#### TABLE 1606.3.3

<table>
<thead>
<tr>
<th>ROOFING MATERIAL</th>
<th>( C_L )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete &amp; clay tile</td>
<td>0.20</td>
</tr>
</tbody>
</table>

#### TABLE 1606.2A

<table>
<thead>
<tr>
<th>VELOCITY PRESSURE ((q)) (^1) (PSF)</th>
<th>FASTEST MILE WIND SPEED, (V) (^2) IN MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-15</td>
<td>34.5</td>
</tr>
<tr>
<td>16</td>
<td>35.2</td>
</tr>
<tr>
<td>17</td>
<td>35.8</td>
</tr>
<tr>
<td>18</td>
<td>36.4</td>
</tr>
<tr>
<td>19</td>
<td>37.0</td>
</tr>
<tr>
<td>20</td>
<td>37.5</td>
</tr>
<tr>
<td>22</td>
<td>38.5</td>
</tr>
<tr>
<td>24</td>
<td>39.5</td>
</tr>
<tr>
<td>26</td>
<td>40.4</td>
</tr>
<tr>
<td>28</td>
<td>41.3</td>
</tr>
<tr>
<td>30</td>
<td>42.1</td>
</tr>
<tr>
<td>35</td>
<td>44.0</td>
</tr>
<tr>
<td>40</td>
<td>45.7</td>
</tr>
<tr>
<td>45</td>
<td>47.3</td>
</tr>
<tr>
<td>50</td>
<td>48.7</td>
</tr>
<tr>
<td>55</td>
<td>50.0</td>
</tr>
<tr>
<td>60</td>
<td>51.3</td>
</tr>
</tbody>
</table>

For SI: 1 mph = 0.447 m/s, 1 psf = 47.8803 Pa, 1 ft = 0.305 m.

**Notes:**

1. A single value for velocity pressure \((q)\) is used for the entire building.
2. \( q = 0.00256 V^2 (H/33)^{2/7} \)
3. \( V = \) Fastest mile wind speed in miles per hour determined from Figure 1606.
4. \( H = \) Mean height of roof above ground or 15 ft whichever is greater. Eave height may be substituted for mean roof height if roof angle “\(a\)” is not more than 10 degrees.
FIGURE 16067.1.5A
EFFECTIVE PEAK VELOCITY-RELATED ACCELERATION COEFFICIENT, $A_v$
FIGURE 16067.1.5A
PEAK ACCELERATION COEFFICIENT, $A_a$
1607.6.4.3 Component certification. When direct component attachment is used for components with performance criteria factors, \((P)\), of 1.0 or greater, in buildings assigned an effective peak velocity-related acceleration, \((A_{e})\), equal to or greater than 0.15 per 1607.1, the manufacturer's certification of the component seismic acceleration operational capacity which meets the requirements of 1607.6.4 shall be submitted to the building official.

1607.6.5 Elevator design requirements. The design and construction of elevators and elevator components in buildings assigned to seismic performance category D or E, according to 1607.1, shall comply with the requirements of ANSI/ASME A 17.1, Appendix E

1607.7 Provisions for seismic inspection and testing are contained in 1708.

SECTION 1608
SPECIAL LOADS

1608.1 Soil Pressures
1608.1.1 Foundation and retaining walls. Foundation walls and retaining walls shall be designed to resist applicable lateral soil loads and applicable fixed or moving surcharge loads. When a geotechnical soil analysis is not available, the soil loads of Table 1608.1.1 shall be the design lateral soil load. The design lateral soil loads given in Table 1608.1.1 are for moist conditions for the specified soils at their optimum densities. Submerged or saturated soil pressures shall include the weight of the buoyant soil plus the hydrostatic loads.

1608.1.2 Segmental retaining walls. Segmental retaining walls shall be designed in conformance with 1815.

1608.1.3 Basement floors. In the design of basement floors and similar approximately horizontal constructions below grade, the upward pressure of water, if any, shall be taken as the full hydrostatic pressure applied over the entire area. The hydrostatic head shall be measured from the underside of the construction.

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

For SE 1 psf = 47.8803 Pa, 1 ft = 0.305 m.

Notes:
1. Compliance with 1804.3 is required.

1608.2 Railing
1608.2.1 Handrail design and construction
1608.2.1.1 Handrails shall be designed and constructed for a concentrated load of 200 lb (890 N) applied at any point and in any direction.

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

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

1608.2.2 Guardrail system design and construction
1608.2.2.1 Guardrail systems shall be designed and constructed for a concentrated load of 200 lb (890 N) applied at any point and in any direction at the top of the guardrail.
1608.2.2 Guardrail systems located other than within dwelling units shall be designed and constructed for a load of 50 plf (730 N/m) applied horizontally at the required guardrail height and a simultaneous load of 100 plf (1459 N/m) applied vertically downward at the top of the guardrail.

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

1608.2.2.4 Loading conditions in 1608.2.1, 1608.2.2.2 and 1608.2.2.3 shall not be applied simultaneously, but each shall be applied to produce maximum stress in each of the respective components or any of the supporting components.

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

1608.2.3 Helistops/Heliports. In addition to other design requirements of this chapter, heliport and helistop landing or touchdown areas shall be designed for the maximum stress induced by the following:

1. Dead load plus actual gross weight of the helicopter plus snow load.
2. Dead load plus two single concentrated impact loads approximately 8 ft (2438 mm) apart anywhere on the touchdown pad (representing each of the helicopter's two main landing gear, whether skid type or wheeled type), with each concentrated load covering 1 sq ft (0.093 m²) and having a magnitude of 0.75 times the gross weight of the helicopter. Both loads acting together total 1.5 times the gross weight of the helicopter.
3. The dead load plus a uniform live load of 60 psf (2873 Pa).

SECTION 1609 LOAD COMBINATIONS

1609.1 Allowable stress design. Every building element shall be provided with sufficient strength to resist the most critical effects resulting from the following combinations of loads:

1. Dead Load + Floor Live + Roof Live
2. Dead Load + Floor Live + Wind (or Seismic/1.4)
3. Dead Load + Floor Live + Wind
4. Dead Load + Floor Live + 1/2 Wind
5. Dead Load + Floor Live + Seismic/1.4

Note:

1. Floor live load shall not be included where its inclusion results in lower stresses in the building element under investigation.

1609.1.1 Stress increases. Allowable stresses specified in the appropriate material standard for allowable stress design are permitted to be increased in accordance with the material design standard when stresses are produced by wind or seismic loading, acting alone or in combination with other loads.

1609.1.2 Stability. All structural members and systems, and all components and cladding in a building or structure shall be anchored to resist wind-induced overturning, uplift, and sliding and to provide continuous load paths for these forces to the foundation. Where a portion of the resistance to these forces is provided by dead load, only two-thirds of the minimum dead load likely to be in place during a design wind event shall be used.

1609.2 Strength design. Except for load combinations which include seismic, load factors for ultimate strength design of concrete, LRFD of wood and plastic design or LRFD of steel shall be as indicated in the appropriate design standards referenced in this code. For load combinations which include seismic loads, every building element shall be provided with sufficient strength to resist the most critical effects resulting from the following combinations of loads.

1. (1.1 + 0.5A,) Dead + Floor Live + Seismic
2. (0.9 - 0.5A,) Dead + Seismic
3. (0.9 - 0.5A,) Dead + (2R/5) Seismic

For columns supporting discontinuous lateral force-resisting elements, the axial compression in the columns shall be computed using the following load combination:

4. (1.1 + 0.5A,) Dead + Live + (2R/5) Seismic

The axial forces in such columns are not required to exceed the capacity of other elements of the structure to transfer such loads to the column.

Where:

Aₗₘₚ The seismic coefficient representing effective peak velocity-related acceleration in accordance with 1607.1.5.
R The response modification factor of the seismic resisting system from Table 1607.3.3.

Notes:

1. Applies to building structural systems which have unreinforced masonry, horizontal prestressed members assigned to Seismic Performance Category D or E (See 1607.3.6.4), or building structural systems with low ductility.
3. 2R15 shall be greater than or equal to 1.0.

1609.2.1 Stability. All structural members and systems, and all components and cladding in a building or structure shall be anchored to resist wind-induced overturning, uplift, and sliding, and to provide continuous load paths for these forces to the foundation. Where a portion of the resistance to these forces is provided by dead load, the following load case shall be used to satisfy this requirement, where dead load shall be
taken as the minimum dead load likely to be in place during a design wind event:

0.9 Dead + 1.3 Wind

SECTION 1610
DEFLECTIONS

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

<table>
<thead>
<tr>
<th>TABLE 1610.1 DEFLECTION LIMITS 1,2,3,4,5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONSTRUCTION</strong></td>
</tr>
<tr>
<td>Roof member supporting plaster, or floor member</td>
</tr>
<tr>
<td>Roof members supporting nonplastered ceilings</td>
</tr>
<tr>
<td>Roof members not supporting ceilings</td>
</tr>
<tr>
<td>Exterior and interior walls and partitions with brittle finishes</td>
</tr>
<tr>
<td>Exterior and interior walls and partitions with flexible finishes</td>
</tr>
<tr>
<td>Farm buildings</td>
</tr>
<tr>
<td>Greenhouses</td>
</tr>
</tbody>
</table>

LL = Live load
DL = Dead load
L = Length of member in same units as deflection

Notes:
1. Concrete structural members shall be governed by ACI 318.
2. For structural roofing and siding made of formed metal sheets, the total load deflection shall not exceed L/60. For secondary structural members to which formed metal roofing or siding is attached, the live load deflection shall not exceed L/150 for roofs and U90 for walls. For roofs, this exception applies only when the metal sheets have no roof covering.
3. The above deflections do not ensure against ponding. Roofs not having sufficient slope or camber to assure adequate drainage shall be investigated for ponding.
4. Flexible, folding, and portable partitions under 6 ft in height are not governed by the provisions of this section.
5. See 2406 for glass supports.

SECTION 1611
MANUFACTURED HOMES

Provisions for manufactured home tie downs are contained in Appendix H. Those provisions are applicable only where included in the adopting ordinance.
CHAPTER 18
FOUNDATIONS AND RETAINING WALLS

SECTION 1801
GENERAL

1801.1 Scope. Provisions of this chapter shall govern the design, construction, and resistance to water intrusion of foundations for buildings and structures.

SECTION 1802
DEFINITIONS

For definitions, see Chapter 2.

SECTION 1803
EXCAVATIONS

1803.1 General

1803.1.1 When excavating for buildings or excavations accessory thereto, such excavations shall be made safe to prevent any danger to life and property.

1803.1.2 Permanent excavations shall have retaining walls of sufficient strength made of steel, masonry, or reinforced concrete to retain embankments, together with any surcharged loads.

1803.1.3 Excavations for any purpose shall not extend within 1 ft (305 mm) of the angle of repose or natural slope of the soil under any footing or foundation, unless such footing or foundation is first properly underpinned or protected against settlement.

1803.2 Support of adjoining buildings and structures

1803.2.1 Notice to adjoining structures. Notice to the owner of adjoining buildings or structures shall be served in writing by the one causing the excavation to be made at least ten days before an excavation is commenced. The notice shall state the depth and location of the proposed excavation.

1803.2.2 Excavation 10 ft (3048 mm) or less. When an excavation extends not more than 10 ft (3048 mm) below the established curb grade nearest the point of excavation under consideration, the owner of the adjoining structure or building shall be afforded the necessary license to enter the premises where the excavation is to be made, and at his own expense, shall provide the necessary underpinning or protection.

1803.2.3 Excavation greater than 10 ft (3048 mm)

1803.2.3.1 When an excavation extends more than 10 ft (3048 mm) below the established curb grade nearest the point of excavation under consideration, the one causing the excavation to be made, if given the necessary license to enter the adjoining premises, shall provide at his own expense one of the following:

1. Underpinning and protection required by that part of the excavation which extends to a depth greater than 10 ft (3048 mm) below the established curb grade nearest the point of excavation under consideration, whether or not the existing footings or foundations extend to the depth of 10 ft (3048 mm) or more below curb grade, or
2. Shoring and bracing of the sides of the excavation required to prevent any soil movement into the excavation. If permanent lateral support is provided, the method used must satisfy requirements of the building official.

1803.2.3.2 If the necessary license is not afforded the person causing the excavation to be made, it shall be the duty of the owner failing to afford such license to provide the required underpinning or protection for which purpose he shall be afforded the necessary license to enter the premises where such excavation is to be made.

1803.2.4 Unestablished curb grade. If there is not an established curb grade, the depth of excavation shall be referred to the level of the ground at the point under consideration.

1803.2.5 Difference in adjacent curb grades

1803.2.5.1 If an existing building or structure requiring underpinning or protection is so located that its curb grade or level is at a higher level than the level to which the excavation is properly referred, then such part of the required underpinning or protection that is necessary due to the difference in these levels shall be made and maintained at the joint expense of the owner of the building or structure and the person causing the excavation to be made.

1803.2.5.2 For the purpose of determining such part of the underpinning or protection that is necessary due to such difference in levels, the level to which a building more than 5 ft (1524 mm) back of the street line is properly referred shall be considered to be the level of the natural ground surface adjoining the building or structure.

1803.2.6 Party walls. A party wall, which is in good condition and otherwise suitable for continued use, shall be underpinned or protected as required at the expense of the person causing the excavation to be made.

1803.2.7 Adjoining structure protection. Where the necessary license has been given to the person making an excavation to enter any adjoining structure for the purpose of underpinning or protecting it, the person receiving such license shall provide for such adjoining structure adequate protection against injury due to the elements resulting from such entry.
1803.2.8 **Backfill.** Only approved granular materials shall be used for backfill. It shall be properly compacted in order to prevent lateral displacements of the soil of the adjoining property after the removal of the shores or braces.

**SECTION 1804**

FOOTINGS AND FOUNDATIONS

1804.1 **General**

1804.1.1 Foundations shall be built on undisturbed soil or properly compacted fill material. Foundations shall be constructed of materials described in this chapter.

1804.1.2 Pile foundations shall be designed and constructed in accordance with 1805.

1804.1.3 The bottom of foundations shall extend no less than 12 inches (305 mm) below finish grade.

1804.1.4 Temporary buildings and buildings not exceeding one story in height and 400 sq ft (37 m2) in area shall be exempt from these requirements.

1804.1.5 Excavations for foundations shall be backfilled with soil which is free of organic material, construction debris, and large rocks.

1804.1.6 Where water impacts the ground from a roof valley, downspout, scupper, or other rain water collection or diversion device, provisions shall be made to prevent soil erosion and direct the water away from the foundation.

1804.1.7 Finish grade shall be sloped away from the foundation for drainage.

1804.1.8 The area under footings, foundations, and concrete slabs on grade shall have all vegetation, stumps, roots, and foreign materials removed prior to their construction. Fill material shall be free of vegetation and foreign material.

1804.2 **Soils investigation**

1804.2.1 **Plain concrete, masonry, or timber footings.** Footings shall be so designed that the allowable bearing capacity of the soil is not exceeded. If structural plain concrete, masonry or timber footings are used, they shall rest on undisturbed or compacted soil of uniform density and thickness. Compacted soils shall be tested to a minimum of 95% of Modified Proctor in accordance with ASTM D 1557 and compacted and tested in lifts not to exceed 12 inches. If sufficient compactibilities exist, soils may be compacted and tested in greater lift thicknesses.

1804.2.2 **Questionable soil.** Where the bearing capacity of the soil is not definitely known or is in question, the building official may require load tests or other adequate proof as to the permissible safe bearing capacity at that particular location. To determine the safe bearing capacity of soil, it shall be tested at such locations and levels as conditions warrant, by loading an area not less than 4 sq ft (0.37 m2) to not less than twice the maximum bearing capacity desired for use. Such double load shall be sustained by the soil for a period of not less than 48 hours with no additional settlement taking place, in order that such desired bearing capacity may be used. Examination of subsoil conditions shall be made at the expense of the owner, when deemed necessary by the building official.

1804.2.3 **Natural solid ground or piles.** Foundations shall be built upon natural solid ground. Where solid natural ground does not occur at the foundation depth, such foundations shall be extended down to natural solid ground or piles shall be used. Foundations may be built upon mechanically compacted earth or fill material subject to approval by the building official upon submittal of evidence that proposed load will be adequately supported.

1804.2.4 **Differential settlement.** Where footings are supported by soils of widely different bearing capacity, the allowable bearing values of the more yielding soil shall be reduced or special provisions shall be made in the design to prevent serious differential settlements.

1804.2.5 **Shifting or moving soils.** When it is definitely known the top or subsoils are of a shifting or moving character, all footings shall be carried to a sufficient depth to insure stability. The excavation around piers shall be backfilled with soils or materials which are not subject to such expansion or contraction.

1804.2.6 **Groundwater table investigation.** A subsurface soil investigation shall be performed to determine the possibility of the groundwater table rising above the proposed elevation of the lowest floor when such floor is located below the finished ground level adjacent to the foundation for more than 75% of the perimeter of the building.

**Exception:** A subsurface soil investigation shall not be required when either of the following conditions is satisfied:

1. Waterproofing is provided in accordance with 1814.2.
2. Satisfactory data from adjacent areas is available which demonstrates that groundwater has not been a problem.

1804.3 **Expansive soils**

1804.3.1 **General.** Footings or foundations for buildings and structures founded on expansive soils shall be designed in accordance with this section. As an alternative to special design, the soil may be removed in accordance with 1804.3.4 or stabilized in accordance with 1804.3.5.
1804.3.2 Soil tests. In areas likely to have expansive soil, the building official may require soil tests to determine if such soils do exist. Soils meeting all four of the following provisions shall be considered expansive, except that tests to show compliance with items 1, 2 and 3 shall not be required if the test prescribed in item 4 is conducted:

1. Plasticity Index (PI) of 15 or greater, determined in accordance with ASTM D 4318.
2. More than 10% of the soil particles pass a #200 sieve (75 um), determined in accordance with ASTM D 422.
3. More than 10% of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D 422.
4. Expansion Index greater than 20, determined in accordance with SBCCI Standard for Expansive Soil Tests.

1804.3.3 Foundations

1804.3.3.1 Footings or foundations placed on or within the active zone of expansive soils shall be designed to resist differential volume changes and to prevent structural damage to the supported structure. Deflection and racking of the supported structure shall be limited to that which will not interfere with the usability and serviceability of the structure.

1804.3.3.2 Foundations placed below where volume change occurs or below expansive soil shall comply with the following provisions:

1. Foundations extending into or penetrating expansive soils shall be designed to prevent uplift of the supported structure.
2. Foundations penetrating expansive soils shall be designed to resist forces exerted on the foundation due to soil volume changes or be isolated from the expansive soil.

1804.3.3.3 Slab-on-ground, mat or raft foundations on expansive soils shall be designed and constructed in accordance with WRI/CRSI Design of Slab-on-Ground Foundations or PTI Design and Construction of Post-Tensioned Slabs-On-Ground.

Exception: Slab-on-ground systems which have performed adequately in soil conditions similar to those encountered at the building site may be used if approved by the building official.

1804.3.4 Removal of expansive soil. The expansive soil may be removed to a depth sufficient to assure a constant moisture content in the remaining soil. Fill material shall not contain expansive soils and shall be placed in accordance with the provisions of 1804.2.3.

Exception: Expansive soil need not be removed to the depth of constant moisture, provided the confining pressure in the expansive soil created by the fill and supported structure exceeds the swell pressure.

1804.3.5 Stabilization. Stabilization of the active zone of expansive soils may be used when approved by the building official. Soils may be stabilized by chemical, dewatering, presaturation or equivalent techniques.

1804.4 Footing design

1804.4.1 The base area of the footings of all buildings shall be designed in the following manner: The area of the footing which has the largest percentage of live load to total load shall be determined by dividing the total load by the allowable soil load. From the area thus obtained, the dead load soil pressure of such footing is determined and the areas of all other footings of the building shall be determined on the basis of their respective dead loads only and such dead load soil pressure. In no case shall the load per sq ft under any portion of any footing, due to the combined dead, live, wind, and any other loads, exceed the safe sustaining power of the soil upon which the footing rests. The total reduced live load occurring in the column immediately above the footing shall be the live load used in the above computation.

1804.4.2 Footings shall be proportioned to sustain the applied loads and induced reactions without exceeding the allowable stresses specified in this code.

1804.5 Concrete footings

1804.5.1 Compressive strength. Concrete in footings shall have a specified compressive strength of not less than 2,500 psi (17 238 kPa) at 28 days.

1804.5.2 Design. Design of footings shall be in accordance with Chapter 19.

1804.5.3 Footing seismic ties. Individual spread footings, bearing on Soil Profile Type S2, S3, or S4, by 1607.3.1, and supporting buildings assigned to Seismic Performance Category D or E, by 1607.1.8, shall be interconnected by ties. All ties shall be capable of resisting, in tension or compression, a force equal to 25% of the effective peak velocity-related acceleration (A), times the column dead plus live load. Individual tie beams are not required when it is demonstrated that equivalent restraint will be provided by structural members within slabs on grade or reinforced concrete slabs on grade or confinement by competent rock, hard cohesive soils, very dense granular soils, or other approved means.

1804.5.4 Pier foundation seismic ties. Pier foundations shall be interconnected by ties for buildings assigned to Seismic Performance Category C, D or E, by 1607.1.8. All ties shall be capable of resisting, in tension or compression, a force equal to 25% of the effective peak velocity-related acceleration (A,) times the column dead plus live load. Individual tie beams are not required when it is demonstrated that equivalent restraint will be provided by structural members within slabs on grade or reinforced concrete slabs on grade or confinement by competent rock, hard cohesive soils, very dense granular soils, or other approved means.
1804.6 Foundation walls
1804.6.1 Concrete and masonry. Concrete and masonry foundation walls shall be designed and constructed in accordance with 1804.6.1.

1804.6.1.1 Plain concrete and plain masonry foundation walls shall be sized in accordance with Table 1804.6.1A, and reinforced concrete and reinforced masonry foundation walls shall be sized in accordance with Table 1804.6.1B, or such walls shall be designed in accordance with ACI 318, NCMA TR68-A, or ACI 530/ASCE 5/TMS 402, or other approved methods. Concrete foundation walls, constructed using insulated concrete forms (ICF), shall be sized in accordance with ACI 318, NCMA TR68-A, or ACI 530/ASCE 5/TMS 402, or other approved methods. In addition, concrete foundation walls using insulated concrete forms (ICF), shall also be constructed in accordance with 1804.6.2.

1804.6.1.2 The minimum thickness of concrete and masonry foundation walls shall be in accordance with 1804.6.1.1 but not less than the thickness of the wall supported.

Exception: Foundation walls not less than 8 inches (203 mm) in thickness and conforming to the provisions of 1804.6.1.1 may be used as foundations for dwellings with walls of brick veneer on frame walls or 10-inch (254 mm) cavity walls, provided the dwelling is not more than two stories in height and the total height of the wall, including the gable, is not more than 28 ft (8.53 m). Foundation walls 8 inches (203 mm) thick supporting brick veneer or cavity walls shall be corbelled with solid units to provide a bearing the full thickness of the wall above. Corbeling of masonry shall be in accordance with 2111.2. The total projection shall not exceed 2 inches (51 mm) with individual corbels projecting not more than one-third the thickness of the unit nor one-half the height of the unit. The top corbel course shall not be higher than the bottom of floor joists and shall be a full header course.

1804.6.1.3 Concrete and masonry foundation walls shall extend above the finished grade a minimum of 4 inches (102 mm) where masonry veneer is used and a minimum of 6 inches (152 mm) elsewhere.

1804.6.1.4 Backfill adjacent to concrete and masonry foundation walls shall not be placed until the walls have sufficient strength and have been anchored to the floor above or have been braced to prevent damage by the backfill.

Exception: When approved by the building official, such bracing is not required for such walls supporting less than 4 ft (1.2 m) of unbalanced backfill.

1804.6.1.5 Curtain walls between solid piers and nonbearing perimeter walls shall be permitted for frame construction and masonry veneer frame construction in dwellings not more than two stories in height, subject to the following limitations:
1. Minimum thickness of the curtain wall shall be 4 inches nominal bonded into the piers and supported on a continuous concrete footing.
2. Masonry bearing piers shall comply with 230.3.2. Pier spacing shall be governed by the beam or girder designed in accordance with 2307.2.
3. Unbalanced fill placed against 4-inch (102 mm) curtain wall shall not exceed 24 inches (610 mm) for solid masonry or 16 inches (406 mm) for hollow masonry.
4. Maximum height of exterior, nonbearing curtain walls shall not exceed ten times the thickness of pier and properly bonded curtain wall.

1804.6.1.6 Foundation walls or stem walls less than three (3) feet in height, with or without unbalanced fill and supporting one (1) story buildings may be six (6) inches in thickness.

1804.6.2 Insulated concrete form foundation walls
1804.6.2.1 Applicability limits. Buildings constructed with insulated concrete form (ICF) foundation walls in accordance with this section are subject to the following limitations:
1. Building plan dimensions do not exceed 60 ft (18.3 m)
2. Floors spans do not exceed 32 ft (9.7 m) and roof spans do not exceed 40 ft (12 m) clear.
3. Buildings are two stories or less in height above grade with no story greater than 10 ft (3.0 m) high.
4. Buildings are not located in seismic map areas having an effective peak velocity related acceleration value, A, of 0.30 or greater.
5. Building floor live loads do not exceed 40 psf.

1804.6.2.2 Flat insulating concrete form wall systems. Flat ICF wall systems shall comply with Figure 1916.3 and shall have a minimum concrete thickness of 5.5 inches (140 mm).

1804.6.2.3 Waffle-grid insulating concrete form wall systems. Waffle-grid ICF wall systems shall have a minimum nominal concrete thickness of 6 inches (152 mm) for the horizontal and vertical concrete members (cores) and the minimum core dimension shall comply with Table 1916.4 and Figure 1916.4.

1804.6.2.4 Screen grid insulating concrete form wall systems. Screen-grid ICF wall systems shall have a minimum nominal concrete thickness of 6 inches for the horizontal and vertical concrete members (cores) and the minimum core dimensions shall comply with Table 1916.4 and Figure 1916.5.

1804.6.2.5 Concrete material. Concrete for insulating concrete form walls shall be in accordance with Chapter 19. The maximum slump shall not be greater.
than 6 inches (152 mm) as determined in accordance with ASTM C 143. The maximum aggregate size shall not be larger than 3/4 inch (19 mm).

**Exception:** Concrete mixes conforming to the ICF manufacturer's recommendations.

### 1804.6.2.6 Reinforcing Steel

#### 1804.6.2.6.1 Reinforcing steel shall meet the requirements of 1903.5. The minimum yield strength of the reinforcing steel shall be 40,000 psi (Grade 40) (276 MPa). Vertical and horizontal wall reinforcements shall not be placed within the outside half of the wall. Steel reinforcement shall have concrete cover in accordance with 1908.6.

**Exception:** Where insulated concrete forms are used and the form remains in place as cover for the concrete, the minimum concrete cover for the reinforcing steel is permitted to be reduced to 3/4 inches.

#### 1804.6.2.6.2 ICF Foundation walls up to 8 ft (24 m) in height shall have a minimum of one continuous #4 horizontal reinforcing bar placed at 48 inches (1.2 m) on center with one bar located within 12 inches (305 mm) of the top of the wall story. ICF Foundation walls greater than 8 ft (24 m) in height shall have a minimum of one continuous #4 horizontal reinforcing bar placed at 36 inches (91.2 m) on center with one bar located within 12 inches (305 mm) of the top of the wall story.

#### 1804.6.2.6.3 Vertical wall reinforcement required by 1804.6.2.2, 1804.6.2.3 or 1804.6.2.4 that is interrupted by wall openings shall have additional vertical reinforcement of the same size placed within 12 inches (305 mm) of each side of the opening.

### 1804.6.2.7 Foam Plastic Insulation

#### 1804.6.2.7.1 Insulating concrete form material shall meet the surface burning characteristics of 2603.3. A thermal barrier shall be provided in accordance with 2603.4.

#### 1804.6.2.7.2 In areas where hazard of termite damage is very heavy in accordance with Figure 2304.1.4, foam plastic insulation shall be permitted below grade on foundation walls in accordance with one of the following conditions:

1. When in addition to the requirements of 2304.1.2, an approved method of protecting the foam plastic and structure from subterranean termite damage is provided.
2. Within Types I, II, and IV construction.
3. On the interior side of basement walls.

#### 1804.6.2.8 Drainage and dampproofing/waterproofing. ICF foundation basements shall be dampproofed or waterproofed in accordance with 1814.

### 1804.6.3 Openings

#### 1804.6.3.1 Ventilation. Crawl spaces under buildings without basements shall be ventilated by approved mechanical means or by openings in foundation walls. Openings shall be arranged to provide cross ventilation and shall be covered with corrosion-resistant wire mesh of not less than 1/4 inch (6.4 mm) nor more than 1/2 inch (12.7 mm) in any dimension. Openings in foundation walls shall be not less than the following:

1. Where wood floor systems are used, such openings shall have a net area of not less than 1 sq ft (0.093 m²) for each 150 sq ft (14 m²) of crawl space.
2. Where other than wood floor systems are used, such openings shall be not less than 1 1/2 sq ft (0.14 m²) of net opening for each 15 linear feet (4572 mm) or major fraction thereof of exterior wall.
3. Where asphalt saturated felt weighing 55 lb (2.7 kg/m²) per square, lapped at least 2 inches (51 mm) at joints, or 4 mil (0.102 mm) polyethylene lapped at least 4 inches (102 mm) at joints, or other approved vapor retarder is installed over the ground surface, the required net area of openings may be reduced to 10% of that required above. There shall be one ventilation opening within 3 ft (914 mm) of each corner, and these shall be of equal size totaling a minimum of 50% of required openings.
4. An operable vent louver shall be permitted only where an approved vapor barrier is installed over the ground surface.
5. Where combustion equipment is installed within a crawl space, air for combustion shall be provided in accordance with 705.1.1.4, 2810, and Chapter 7 of the Standard Mechanical Code.

#### 1804.6.3.2 Access. Usable crawl spaces under buildings without basements shall be provided with a minimum of one access opening not less than 18x24 inches (457x610 mm). Access openings shall be readily accessible and provided with a door or device that may be easily removed or operated. For access to mechanical equipment installed in underfloor areas see Section 304.5 of the Standard Mechanical Code.

### 1804.6.4 Masonry with Type VI construction

Foundation walls of hollow masonry supporting Type VI construction shall be capped with 4 inches (102 mm) of solid masonry or concrete or shall have cavities of the top course filled with concrete or grout unless a sill plate of 2 inch (51 mm) nominal thickness bears on both face shells.
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</table>

For SI: 1 inch = 25.4 mm  
1 psf = 0.0479 kN/m²  
1 ft = 0.3 m

Notes:
1. Deflection criteria: L/240
2. Interpolation between rebar sizes and spacing is not permitted
3. Refer to Table 1916.4 for wall dimensions.
4. Soil classes are in accordance with the Unified Soil Classification System. See 1608.1.1.
1804.8 Wood foundation systems. The foundation system may be of wood when the engineering design is based upon the bearing capacity of the soil (see 1804.2) and the design and construction complies with the provisions of AF&PA Technical Report No. 7.

1804.9 Seismic provisions

1804.9.1 Seismic investigation. Foundations of buildings assigned to Seismic Performance Category D or E, by 1607.1.8, shall conform to the requirements of this section. A soil investigation report, which determines the potential hazards due to slope instability, liquefaction, and surface rupture, due to faulting or lateral spreading and the determination of lateral pressures on below ground building walls and retaining walls, shall be submitted to the building official.

1804.9.2 Soil bearing. For the load combinations, including seismic as specified in 1609, the soil bearing strength shall be sufficient to resist loads, at acceptable strains, considering both the short duration of loading and the dynamic properties of the soil.

1804.9.3 Soil seismic lateral pressure. Lateral soil pressure on below ground surface building walls and retaining walls due to earthquake motions shall be included in the design of buildings assigned to Seismic Performance Category D or E, by 1607.1.8.

SECTION 1805
PILES

1805.1 Investigation. Pile foundations shall be designed and installed on the basis of a foundation investigation and report which shall include borings, test pits or other subsurface exploration at locations and depths sufficient to determine the position and adequacy of the bearing soils except where sufficient data upon which to base the design and installation is available. The investigation and report shall include but not be limited to the following:
1. Recommended pile types and installed capacities.
2. Driving criteria.
3. Installation and field inspection procedures.
4. Pile load test requirements.
5. Durability of pile materials.
6. Designation of bearing stratum or strata.

1805.2 Special types of piles. The use of types of piles not specifically mentioned herein may be permitted, subject to the approval of the building official, upon the submission of acceptable test data, calculations and other information relating to the structural properties and load capacity of such piles. The allowable stresses shall not in any case exceed the limitations specified herein.

1805.3 Protection of pile materials. Where boring records or site conditions indicate possible deleterious action on pile materials because of soil constituents, changing water levels or other factors, the pile materials shall be adequately protected by materials, methods or processes approved by the building official. Protective materials shall be applied to the piles so as not to be rendered ineffective by driving.

1805.4 Lateral support

1805.4.1 General. Any soil other than fluid soil shall be deemed to afford sufficient lateral support to the pile to prevent buckling and to permit the design of the pile in accordance with accepted engineering practice and the applicable provisions of this code.

1805.4.2 Unbraced piles. All piles standing unbraced in air, water, or soils not capable of providing lateral support shall be designed as columns in accordance with the provisions of this code.

1805.4.3 Pile bending seismic design. Piling for buildings assigned to Seismic Performance Category D or E, by 1607.1.8, shall be designed for the maximum imposed curvatures resulting from seismic forces on free-standing piles when the piles are located in loose granular soils or in Soil Profile Type S3 or S4, by 1607.3.1. The piles shall be designed and detailed in accordance with 1912.6 and 2212.4 for a length equal to 120% of the flexural length. The flexural length shall be the distance from the point of fixity to the pile cap.

1805.5 Group action. In cohesive soils, the compressive load capacity of a group of friction piles shall be analyzed by a rational method approved by the building official and where such analysis indicates, the individual allowable pile load shall be reduced accordingly.

1805.6 Stability

1805.6.1 All piles shall be braced to provide lateral stability in all directions. Three or more piles connected by a rigid cap shall be considered as being braced provided that the piles are located in radial directions from the centroid of the group not less than 60 degrees (1 rad) apart. A two pile group in a rigid cap shall be considered to be braced along the axis connecting the two piles. Methods used to brace piles shall be subject to the approval of the building official.

1805.6.2 Piles supporting walls shall be driven alternately in lines spaced at least 1 ft (305 mm) apart and located symmetrically under the center of gravity of the wall load carried, unless effective measures are taken to provide for eccentricity and lateral forces, or the wall piles are adequately braced to provide for lateral stability. A single row of piles without lateral bracing may be used for one and two family dwellings and lightweight construction not exceeding two stories or 35 ft (11 m) in height provided the centers of the piles are located within the width of the foundation wall.
CHAPTER 19
CONCRETE

SECTION 1901
GENERAL

1901.1 Scope
1901.1.1 Provisions of this chapter shall govern the mate-
rials, design and construction of concrete used in build-
ings.

1901.1.2 Structural members of plain and reinforced con-
crete, including prestressed concrete, shall be designed and
constructed in accordance with the provisions of this chapter
and ACI 318. Structural concrete slabs cast on stay-in-place,
noncomposite steel form deck shall comply with this chapter
and ACI 318. The design of composite concrete on
stay-in-place form deck shall comply with ANSI/ASCE 3.

1901.2 Special provisions for seismic design. Refer to 1912.1
for seismic design requirements for reinforced concrete.

Refer to 1912.2 for seismic design requirements for plain
concrete.

SECTION 1902
DEFINITIONS

For definitions, see Chapter 2.

SECTION 1903
MATERIALS

1903.1 General. Materials used to produce concrete and
admixtures for concrete shall comply with the requirements
of this section and ACI 318.

1903.2 Cements. Cement shall conform to ASTM C 150,
ASTM C 595 or ASTM C 845.

Exception: Type S or SA cement manufactured under
ASTM C 595 shall not be used as the principal cementi-
tious material in structural concrete.

1903.3 Aggregates
1903.3.1 Concrete aggregates shall conform to ASTM C
33 or to ASTM C 330.

1903.3.2 Aggregates failing to meet the standards listed
in 1903.3.1, but which have shown by special test or
actual service to produce concrete of adequate strength
and durability may be used where authorized by the
building official.

1903.3.3 Nominal maximum size of coarse aggregate
shall be not larger than:

1. 1/5 the narrowest dimension between sides of
   forms, nor
2. 1/3 the depth of slabs, nor
3. 3/4 the minimum clear spacing between individual
   reinforcing bars or wires, bundles of bars, or pre-
   stressing tendons or ducts.

These limitations shall not apply if, in the judgment of the
engineer, workability and methods of consolidation are such
that concrete can be placed without honeycomb or voids.

1903.4 Water
1903.4.1 Water used in mixing concrete shall be clean and free
from injurious amounts of oils, acids, alkalis, salts, organic
materials, or other substances that may be deleterious to
concrete or reinforcement.

1903.4.2 Mixing water for prestressed concrete or for concrete
that will contain aluminum embedments, including that portion
of mixing water contributed in the form of free moisture on
aggregates, shall not contain deleterious amounts of chloride
ion. See 1904.4.

1903.4.3 Nonpotable water shall not be used in concrete unless
specific requirements of ACI 318 allowing the use of
nonpotable water are satisfied.

1903.5 Steel reinforcement
1903.5.1 Reinforcement shall be deformed reinforcement,
except that plain reinforcement shall be permitted for spirals or
tendons. Reinforcement consisting of structural steel, steel
pipe, or steel tubing shall be permitted as specified in ACI 318.

1903.5.2 Welding of reinforcing bars shall conform to
ANSI/AWS DIA. The type and location of welded splices and
other required welding of reinforcing bars shall be indicated on
the design drawings or in the project specifications. ASTM
reinforcing bar specifications, except for ASTM A 706, shall
be supplemented to require a report of material properties
necessary to conform to welding procedures specified in
ANSI/AWS D 1.4.

1903.5.3 Reinforcement shall conform to the applicable
ASTM standards listed in ACI 318.

1903.6 Admixtures
1903.6.1 Admixtures to be used in concrete shall comply
with ACI 318 and be subject to prior approval by the engi-
neer.

1903.6.2 An admixture shall be shown capable of main-
taining essentially the same composition and performance
throughout the work as the product used in establishing
concrete proportions in accordance with 1905.2.
1903.6.3 Calcium chloride or admixtures containing chloride from other than impurities from admixture ingredients shall not be used in prestressed concrete, in concrete containing embedded aluminum, or in concrete cast against stay-in-place galvanized steel forms. See 1904.3 and 1904.4.

1903.6.4 Air-entraining admixtures, water-reducing admixtures, retarding admixtures, accelerating admixtures, water-reducing and retarding admixtures, and water-reducing and accelerating admixtures shall conform to the applicable ASTM standards listed in ACI 318.

1903.6.5 Fly ash or other pozzolans used as admixtures shall conform to ASTM C 618. The building official shall require certification of all fly ash materials used in concrete as conforming to the ASTM C 618 specification.

1903.6.6 Ground granulated blast furnace slag used as an admixture shall conform to ASTM C 989.

1903.7 Storage of materials

1903.7.1 Cementitious materials and aggregate shall be stored in such manner as to prevent deterioration or intrusion of foreign matter.

1903.7.2 Any material that has deteriorated or has been contaminated shall not be used for concrete.

1903.8 Tests of materials

1903.8.1 The building official shall have the right to order testing of any materials used in concrete construction to determine if materials are of quality specified.

1903.8.2 Tests of materials and of concrete shall be made in accordance with ASTM standards listed in ACI 318. Laboratories conducting tests on concrete and concrete aggregates for use in construction shall comply with ASTM C 1077 except Section 7.4.

1903.8.3 A complete record of tests of materials and of concrete shall be available for inspection during progress of work and for 2 years after completion of the project and shall be preserved by the inspecting engineer or architect for that purpose.

SECTION 1904
DURABILITY REQUIREMENTS

1904.1 Water-Cementitious materials ratio

1904.1.1 Cementitious materials. For purposes of this section, a cementitious material is one specified in 1903 which has cementing value when used in concrete either by itself, such as portland cement, blended hydraulic cements or expansive cement, or when used in combination with fly ash, other raw or calcined natural pozzolans, silica fume and/or ground granulated, blast furnace slag.

1904.1.2 Calculation of water-cementitious materials ratio. The water-cementitious materials ratio requirement of Tables 1904B and 1904D, shall be calculated using the weight of cement meeting ASTM C 150, ASTM C 595, or ASTM C 845 plus the weight of fly ash and other pozzolans meeting ASTM C 618, ground granulated, blast furnace slag meeting ASTM C 989 and silica fume meeting ASTM C 1240, if any, except that if concrete is exposed to deicing chemicals, the limits of 1904.2.3 for the amount of fly ash, pozzolans, silica fume, ground granulated, blast furnace slag or the combination of these materials shall be met.

1904.2.3 Limitations on use of certain cementitious materials. For concrete exposed to deicing chemicals, the maximum weight of fly ash, other pozzolans, silica fume, or ground granulated, blast furnace slag that is included in the concrete shall not exceed the percentages of the total weight of cementitious materials specified in Table 1904F.

1904.3 Exposure to sulfate-containing solutions. Concrete to be exposed to sulfate-containing solutions shall conform to requirements of Table 1904D or be made with a cement that provides sulfate resistance and used in concrete with maximum water-cementitious materials ratio or minimum specified compressive strength from Table 1904D. Calcium chloride as an admixture shall not be used in concrete to be exposed to severe or very severe sulfate containing solutions, as defined in Table 1904D.
1904.4 Water soluble chloride ion content. For corrosion protection of reinforcement in concrete, maximum water soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious materials and admixtures shall not exceed the limits of Table 1904E. Tests performed to determine water soluble chloride ion content, shall conform to ASTM C 1218.

1904.5 Corrosion protection for reinforced concrete. When concrete with reinforcement will be exposed to chlorides from deicing chemicals, salts, salt water, brackish water, sea water, or spray from these sources, requirements of Table 1904B for water-cementitious materials ratio and concrete strength, and the minimum concrete cover requirements of 1908.6 shall be satisfied. Refer to ACI 318 for unbonded prestressing tendons.

<table>
<thead>
<tr>
<th>EXPOSURE CONDITION</th>
<th>MAXIMUM WATER CEMENTITIOUS MATERIALS RATIO, BY WEIGHT, FOR NORMAL WEIGHT &amp; LIGHTWEIGHT AGGREGATE CONCRETE (psi)</th>
<th>MINIMUM Vc FOR NORMAL WEIGHT &amp; LIGHTWEIGHT AGGREGATE CONCRETE (psi)</th>
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<tr>
<td>Concrete intended to have low permeability when exposed to water</td>
<td>0.50</td>
<td>4,000</td>
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<tr>
<td>For corrosion protection of reinforcement in concrete exposed to chlorides from deicing chemicals, salts, salt water, brackish water, sea water, or spray from these sources</td>
<td>0.40</td>
<td>5,000</td>
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For SI: 1 psi = 6.8948 kPa.

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<tr>
<th>Type and/or Location Of Concrete Element</th>
<th>MINIMUM SPECIFIED COMPRESSION STRENGTH (f'c)’ (PSI) Weathering Probability 2 Negligible Moderate Severe</th>
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<tbody>
<tr>
<td>Basement walls and foundations not exposed to the weather</td>
<td>2,500 2,500 2,500 3</td>
</tr>
<tr>
<td>Basement slabs and interior slabs and interior slabs-on-grade, except garage floor slabs</td>
<td>2,500 2,500 2,500 3</td>
</tr>
<tr>
<td>Basement walls, foundation walls, exterior walls, and other vertical concrete surfaces exposed to the weather</td>
<td>2,500 3,000 4 3,000 4</td>
</tr>
<tr>
<td>Porches, carport slabs, and steps exposed to the weather, and garage floor slabs</td>
<td>2,500 3,000 4 3,500 4</td>
</tr>
</tbody>
</table>

For SI: 1 psi = 6.8948 kPa.

Notes:
1. At 28 days, psi.
2. See Figure 1904 for Weathering Probability.
3. Concrete in these locations which may be subject to freezing and thawing during construction shall be air-entrained concrete in accordance with Table 1904A.
4. Concrete shall be air-entrained in accordance with Table 1904A.
TABLE 1905.313
REQUIRED AVERAGE COMPRESSIVE STRENGTH
WHEN DATA IS NOT AVAILABLE TO ESTABLISH
A STANDARD DEVIATION

<table>
<thead>
<tr>
<th>SPECIFIED COMPRESSIVE STRENGTH, $f'_C$ (psi)</th>
<th>REQUIRED AVERAGE COMPRESSIVE STRENGTH, $f'_c$ (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 3,000</td>
<td>$f'_C + 1,000$</td>
</tr>
<tr>
<td>3,000 to 5,000</td>
<td>$f'_C + 1,200$</td>
</tr>
<tr>
<td>Over 5,000</td>
<td>$f'_C + 1,400$</td>
</tr>
</tbody>
</table>

For SI: 1 psi = 6.8948 kPa.

1905.3.3 Documentation of average strength. Documentation that proposed concrete proportions will produce an average compressive strength equal to or greater than required average compressive strength (1905.3.2) shall consist of a field strength test record, several strength test records, or trial mixtures.

1905.3.3.1 When test records are used to demonstrate that proposed concrete proportions will produce the required average strength $f'_{cr}$ (1905.3.2), such records shall represent materials and conditions similar to those expected. Changes in materials, conditions, and proportions within the test records shall not have been more restricted than those for proposed work. For the purpose of documenting average strength potential, test records consisting of less than 30, but not less than 10 consecutive tests shall be permitted provided test records encompass a period of time not less than 45 days. Required concrete proportions shall be permitted to be established by interpolation between the strengths and proportions of two or more test records each of which meets other requirements of 1905.3.

1905.3.3.2 When an acceptable record of field test results is not available, concrete proportions may be established based on trial mixtures meeting the following restrictions:
1. Combination of materials shall be those for proposed work.
2. Trial mixtures having proportions and consistencies required for proposed work shall be made using at least three different water-cementitious materials ratios or cementitious materials contents that will produce a range of strengths encompassing the required average strength $f'_{cr}$.
3. Trial mixtures shall be designed to produce a slump within ±0.75 inches (19 mm) of maximum permitted, and for air-entrained concrete, within ±0.5% of maximum allowable air content.
4. For each water-cementitious materials ratio or cementitious materials content, at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192. Cylinders shall be tested at 28 days or at test age designated for determination of $f'_C$.
5. From results of cylinder tests a curve shall be plotted showing relationship between water-cementitious materials ratio or cementitious materials content and compressive strength at designated test age.
6. Maximum water-cementitious materials ratio or minimum cementitious materials content for concrete to be used in proposed work shall be that shown by the curve to produce the average strength required by 1905.3.2, unless a lower water-cementitious materials ratio or higher strength is required by 1904.

1905.4 Proportioning without field experience or trial mixtures

1905.4.1 If data required by 1905.3 are not available, concrete proportions shall be based upon other experience or information, if approved by the building official. The required average compressive strength $f'_{cr}$ of concrete produced with materials similar to those proposed for use shall be at least 1200 psi greater than the specified compressive strength $f'_c$. This alternative shall not be used for specified compressive strength greater than 4000 psi.

1905.4.2 Concrete proportioned in accordance with 1905.4 shall also conform to durability requirements of 1904 and to compressive strength test criteria of 1905.6.

1905.5 Average strength reduction. As data becomes available during construction, it shall be permitted to reduce the amount by which value $f'_{cr}$ must exceed the specified value of $f'_c$, provided:
1. 30 or more test results are available and average of test results exceeds that required by 1905.3.2.1 using a standard deviation calculated in accordance with 1905.3.1.1, or
2. 15 to 29 test results are available and average of test results exceeds that required by 1905.3.2.1 using a standard deviation calculated in accordance with 1905.3.1.2, and
3. Durability requirements of 1904 are met.

1905.6 Evaluation and acceptance of concrete

1905.6.1 Frequency of testing

1905.6.1.1 Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 50 cu yd (38 m³) of concrete. Concrete test reports used to establish strength requirements shall be submitted to the Building Official.

1905.6.1.2 On a given project, if total volume of concrete is such that frequency of testing required by 1905.6.1.1 would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.

1905.6.1.3 When total quantity of a given class of concrete is less than 50 cu yd (38 m³), strength tests are not required when evidence of satisfactory strength is submitted to and approved by the building official.
1905.6.1.4 A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days or at test age designated for determination of $f'_c$.

1905.6.2 Laboratory-cured specimens
1905.6.2.1 Samples for strength tests shall be taken in accordance with ASTM C 172.

1905.6.2.2 Cylinders for strength tests shall be molded and laboratory-cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39.

1905.6.2.3 Strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:
1. Every arithmetic average of any three consecutive strength tests equals or exceeds $f'_c$.
2. No individual strength test (average of two cylinders) falls below $f'_c$ by more than 500 psi (3450 kPa).

1905.6.2.4 If either of the requirements of 1905.6.2.3 is not met, steps shall be taken to increase the average of subsequent strength test results. Requirements of 1905.6.2.3(2) shall be observed if requirement of 1905.6.2.3(2) is not met.

1905.6.3 Field-cured specimens
1905.6.3.1 The building official may require strength tests of cylinders cured under field conditions to check adequacy of curing and protection of concrete in the structure.

1905.6.3.2 Field-cured cylinders shall be cured under field conditions in accordance with ASTM C 31.

1905.6.3.3 Field-cured test cylinders shall be molded at the same time and from the same samples as laboratory-cured test cylinders.

1905.6.3.4 Procedures for protecting and curing concrete shall be improved when strength of field-cured cylinders at test age designated for determination of $f'_c$ is less than 85% of that of companion laboratory-cured cylinders. The 85% may be waived if field-cured strength exceeds $f'_c$ by more than 500 psi (3450 kPa).

1905.6.4 Investigation of low-strength test results
1905.6.4.1 If any strength test (1905.6.1.4) of laboratory-cured cylinders falls below specified value of $f'_c$ by more than 500 psi (3450 kPa) (1905.6.2.3(2)) or if tests of field-cured cylinders indicate deficiencies in protection and curing (1905.6.3.4) steps shall be taken to assure that load-carrying capacity of the structure is not jeopardized.

1905.6.4.2 If the likelihood of low-strength concrete is confirmed and computations indicate that load-carrying capacity may have been significantly reduced, tests of cores drilled from the area in question may be required in accordance with ASTM C 42. In such case, three cores shall be taken for each strength test more than 500 psi (3450 kPa) below specified value of $f'_c$.

1905.6.4.3 If concrete in the structure will be dry under service conditions, cores shall be air dried (temperature 60 to 80°F (15.6 to 26.7°C), relative humidity less than 60%) for 7 days before test and shall be tested dry. If concrete in the structure will be more than superficially wet under service conditions, cores shall be immersed in water for at least 40 hours and be tested wet.

1905.6.4.4 Concrete in an area represented by core tests shall be considered structurally adequate if the average of three cores is equal to at least 85% of $f'_c$ and if no single core is less than 75% off $f'_c$. Additional testing of cores extracted from locations represented by erratic core strength results shall be permitted.

1905.6.4.5 If criteria of 1905.6.4.4 are not met, and if structural adequacy remains in doubt, the engineer or the building official may order load tests as outlined in Chapter 20 of ACI 318 for the questionable portion of the structure, or take other appropriate action.

SECTION 1906
MIXING AND PLACING CONCRETE

1906.1 Preparation of equipment and place of deposit.
Preparation before concrete placement shall include the following:
1. All equipment for mixing and transporting concrete shall be clean.
2. All debris and ice shall be removed from spaces to be occupied by concrete.
3. Forms shall be properly coated.
4. Masonry filler units that will be in contact with concrete shall be well-drenched.
5. Reinforcement shall be thoroughly clean of ice or other deleterious coating.
6. Water shall be removed from place of deposit before concrete is placed unless a tremie is used or unless otherwise permitted by the building official.
7. All laitance and other unsound material shall be removed before additional concrete is placed against hardened concrete.

1906.2 Mixing
1906.2.1 All concrete shall be mixed until there is a uniform distribution of materials and shall be discharged completely before mixer is recharged.

1906.2.2 Ready-mixed concrete shall be mixed and delivered in accordance with requirements of ASTM C 94 or ASTM C 685.

1906.2.3 Job-mixed concrete shall be mixed in accordance with ACI 318.
3105.5.3 Heights and areas
3105.5.3.1 Membrane structures shall be limited to one story in height but shall not be limited in number of feet of height.

3105.5.3.2 For determining allowable area, the construction type for a membrane structure shall be based on the support system. Air supported membrane structures shall not exceed the allowable areas listed in Table 500 for Type IV unprotected construction.

3105.5.3.3 Area increases permitted by 503.3 shall be permitted.

3105.5.4 Occupancy separation. A membrane structure building which is occupied by more than one use group shall comply with 303 and 704.1.

3105.6 Mixed construction
3105.6.1 General. Membrane structures shall be permitted to be utilized as specified in this section as a portion of buildings of other types of construction. Height and area limits shall be as specified for the type of construction and occupancy of the building.

3105.6.2 Class I membrane. A Class I membrane shall be permitted for use as the roof or as a skylight of any building or atrium of a building of any type of construction provided it is at least 20 ft (6096 mm) above any floor, balcony or gallery and has a horizontal separation greater than 15 ft (4572 mm) from the edge of the membrane.

3105.6.3 Class II membrane. A Class II membrane shall be permitted to be used as the roof or as a skylight on buildings of Types III, IV-Unprotected, V, and VI construction provided it is at least 20 ft (6096 mm) above any floor, balcony or gallery and has a horizontal separation greater than 15 ft (4572 mm) from the edge of the membrane.

3105.7 Structural
3105.7.1 General. The design, materials and construction of the building shall be based upon plans and specifications by a licensed architect or engineer licensed to practice as such.

3105.7.2 Loads. The structure shall be designed and constructed to sustain all dead loads, loads due to tensioning or inflation and live loads including wind, and seismic loads.

SECTION 3106
CANOPIES ON EXTERIOR WALLS

3106.1 Over public property. Canopies extending over public property shall comply with the requirements of Chapter 32.

3106.2 Other permanent canopies. Other permanent canopies may extend over adjacent open spaces and be of any material permitted by this code provided:

1. When located less than 30 ft (9144 mm) from an interior lot line or other structure, the canopy frame and its supports shall be of noncombustible material, fire retardant treated wood, wood of Type III sizes, or of 1-hour fire resistant construction. Canopy coverings shall comply with the following:

   1. Any textile covering for the canopy shall be flame resistant as determined in accordance with 3103.1.
   2. Any canopy covering, other than textiles, shall have a flame spread index not greater than 25 when tested in accordance with ASTM E 84 in the form intended for use.

2. The canopy shall have at least one long side open.
3. The maximum horizontal width of the canopy shall not exceed 15 ft (4572 mm).
4. The fire resistance of exterior walls shall not be reduced.

SECTION 3108
SIGNS

3108.1 General
3108.1.1 Outdoor advertising displays. Outdoor advertising display means any letter, figure, character, mark, plane, point, marquee sign, design, poster, pictorial, picture, stroke, stripe, line, trademark, reading matter, or illuminated service, which shall be so constructed, placed, attached, painted, erected, fastened, or manufactured in any manner whatsoever, so that the same shall be used for the attraction of the public to any place, subject, person, firm, corporation, public performance, article, machine, or merchandise, whatsoever, which is displayed in any manner whatsoever outdoors. Every outdoor display shall be classified and conform to the requirements of that classification as set forth in this chapter.

3108.1.2 Classifications. For the purpose of this chapter and the regulations and provisions thereof, outdoor advertising displays shall be classified as a ground, marquee, projection, roof, shingle, spectacular or wall sign as defined in 202.

3108.1.3 Permits required
3108.1.3.1 An outdoor advertising display sign shall not hereafter be erected, constructed, altered or maintained except as provided in this code, until after permit for the same has been issued by the building official as required in 104 and the applicable fee paid.

3108.1.3.2 A permit fee shall not be required for a shingle sign over a show window or door of a store or business establishment, announcing without display or elaboration only the name of the proprietor and
nature of the business; nor shall a permit be required for a ground sign, providing such sign is not over 15 sq ft (1.4 m²) in area.

3108.1.4 Identification of signs. Every outdoor advertising display sign hereafter erected, constructed or maintained, for which a permit is required shall be plainly marked with the name of the person, firm or corporation erecting and maintaining such sign and shall have affixed on the front thereof the permit number issued for said sign by the building official.

3108.1.5 Sign inspection. Every ground sign, roof sign, wall sign, and projection sign, may be inspected by the building official or his authorized representative at intervals as required by the building official.

3108.1.6 Unsafe signs. Should any sign become insecure or in danger of falling or otherwise unsafe in the opinion of the building official, the owner thereof, or the person or firm maintaining the same, shall upon written notice from the building official, forthwith in the case of immediate danger and in any case within 10 days, remove such sign or secure the same in a manner to be approved by the building official, in conformity with the provisions of this code. If such order is not complied within 10 days, the building official shall remove such sign at the expense of the owner or lessee thereof.

3108.1.7 Maintenance. All signs for which a permit is required, together with all their supports, braces, guys and anchors shall be kept in repair and unless of galvanized or noncorroding metal shall be thoroughly painted at least once every 2 years. The building official may order the removal of any sign that is not maintained in accordance with the provisions of this section. Such removal shall be at the expense of the owner or lessee thereof.

3108.1.8 Unlawful signs. In case any sign shall be installed, erected, or constructed in violation of any of the terms of this code, the building official shall notify, by registered mail or written notice served personally, the owner or lessee thereof to alter such sign so as to comply with this code or the zoning regulations and to secure the necessary permit therefor, or to remove the sign. If such order is not complied within 10 days, the building official shall remove such sign at the expense of the owner or lessee thereof.

3108.1.9 Location restrictions. An outdoor advertising display sign shall not be erected, constructed or maintained so as to obstruct any fire escape or any window or door or opening used as a means of egress or so as to prevent free passage from one part of a roof to any other part thereof. A sign shall not be attached in any form, shape or manner to a fire escape, nor be placed in such manner as to interfere with any opening required for legal ventilation.

3108.1.10 Signs projecting over public property. Signs projecting from a building or extending over public property shall maintain a clear height of 9 ft (2743 mm) above the sidewalk and all such signs shall extend not more than within 18 inches (457 mm) of the curbside.

3108.2 Definitions. For definitions, see Chapter 2.

3108.3 Structural requirements

3108.3.1 Design required. Before a permit shall be granted, the erector of every outdoor advertising sign, with the exception of shingle signs and light cloth temporary signs, shall submit to the building official a design and stress diagram or plan, containing the necessary information to enable the building official to determine that such sign complies with all the regulations of this code.

3108.3.2 Wind pressure. In the design and erection of all outdoor advertising display signs, the effect of wind shall be carefully considered. All signs shall be constructed to withstand the wind pressure as specified in 1606.

3108.3.3 Working stresses. In all outdoor advertising display signs, the allowable working stresses shall conform with the requirements of 1609.

Exceptions:
1. The allowable working stresses for steel and wood shall be in accordance with the provisions of Chapter 22 and Chapter 23.
2. The working strength of chains, cables, guys, or steel rods shall not exceed one-fifth of the ultimate strength of such chains, cables, guys, or steel.

3108.4 Construction

3108.4.1 Ground signs

3108.4.1.1 Lighting reflectors may project beyond the face of the sign.

3108.4.1.2 The bottom coping of every ground sign shall be not less than 3 ft (914 mm) above the ground or street level, which space may be filled with platform decorative trim or light wooden construction.

3108.4.1.3 Every ground sign shall provide rigid construction to withstand wind action from any direction.

3108.4.1.4 Any person or persons, partnership, firm, or corporation occupying any vacant lot or premises by means of a ground sign shall be subject to the same duties and responsibilities as the owner of the lot or premises, with respect to keeping the same clean, sanitary, inoffensive, free and clear of all noxious substances and unsightly conditions on the ground in the vicinity of such ground sign on said premises for which they may be responsible.