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CHAPTER 3

USE OR OCCUPANCY

SECTION 301.0 GENERAL

301.1 Scope: The provisions of this chapter shall control the classification of all buildings and structures as to use group.

301.2 Application of other laws: The provisions of this chapter shall not be deemed to nullify any provisions of the *zoning* law or any other statute of the jurisdiction pertaining to the location or occupancy of buildings, except as is specifically required by the provisions of this code.

SECTION 302.0 CLASSIFICATION

302.1 General: All structures shall be classified with respect to occupancy in one or more of the use groups listed below. Where a structure is proposed for a purpose which is not specifically provided for in this code, such structure shall be classified in the use group which the occupancy most nearly resembles.

1. Assembly (see Section 303.0): Use Groups A-1, A-2, A-3, A-4 and A-5
2. Business (see Section 304.0): Use Group B
3. Educational (see Section 305.0): Use Group E
4. Factory and Industrial (see Section 306.0): Use Groups F-1 and F-2
5. High Hazard (see Section 307.0): Use Groups H-1, H-2, H-3 and H-4
6. Institutional (see Section 308.0): Use Groups I-1, I-2 and I-3
7. Mercantile (see Section 309.0): Use Group M
8. Residential (see Section 310.0): Use Groups R-1, R-2, R-3 and R-4
9. Storage (see Section 311.0): Use Groups S-1 and S-2
10. Utility and Miscellaneous (see Section 312.0): Use Group U

302.1.1 Specific occupancy areas: Specific occupancy areas which are incidental to the main use group shall be separated and protected in accordance with Table 302.1.1 and shall be classified in accordance with the main use group of the portion of the building in which the specific occupancy area is located. Where the building, or portion thereof, containing the specific occupancy area is required to be protected with an *automatic fire suppression system*, the separation alternative of Table 302.1.1 shall not apply.

Exception: Specific occupancy areas within and serving a *dwelling unit* are not required to comply with this section.

Table 302.1.1
SPECIFIC OCCUPANCY AREAS

Room or area[b]	Separation[a]/protection
All use groups:	
Paint shops in occupancies other than Use Group F employing hazardous materials in quantities less than those which cause classification as Use Group H	2 hours; or 1 hour and automatic fire suppression system
Waste and soiled linen collection rooms and chute termination rooms	1 hour and automatic fire suppression system
Waste and soiled linen chute access rooms	1 hour; or automatic fire suppression system with smoke partitions
Boiler and furnace rooms	1 hour; or automatic fire suppression system with smoke partitions
Incinerator rooms	2 hours and automatic fire suppression system
Use Groups A, B, E, I-1, R-1, R-2: Storage rooms more than 50 square feet in area but not more than 100 square feet in area	1 hour; or automatic fire suppression system with smoke partitions
Storage rooms more than 100 square feet in area	Automatic fire suppression system with smoke partitions
Physical plant maintenance shop and workshop	2 hours; or 1 hour and automatic fire suppression system
Use Groups I-2, I-3: Boiler and furnace rooms	1 hour and automatic fire suppression system
Handicraft shops, kitchens, and employee locker rooms	1 hour; or automatic fire suppression system with smoke partitions
Laundries greater than 100 square feet in area	1 hour and automatic fire suppression system
Storage rooms more than 50 square feet in area but not more than 100 square feet in area	Automatic fire suppression system with smoke partitions
Storage rooms more than 100 square feet in area	1 hour and automatic fire suppression system
Physical plant maintenance shop and workshop	1 hour and automatic fire suppression system
Use Group I-2: Gift/retail shops and laboratories employing hazardous quantities less than those which cause classification as Use Group H	1 hour; or automatic fire suppression system with smoke partitions
Use Group I-3 padded cells	1 hour and automatic fire suppression system

Note a. For requirements for fireresistance rated separations and smoke partitions, see Section 302.1.1.1.
Note b. 1 square foot = 0.093 m^2.

302.1.1.1 Separation: Where Table 302.1.1 requires a fireresistance rated separation, the specific occupancy area shall be separated from the remainder of the building with *fire separation assemblies* (see Section 709.0). Where Table 302.1.1 requires smoke partitions, the smoke partitions shall be constructed of materials consistent with the type of construction and shall be capable of resisting the passage of smoke. The smoke partitions shall extend from the floor to the underside of the fireresistance rated floor/ceiling or roof/ceiling assembly or to the underside of the floor or roof deck above. All doors shall be self-closing or automatic-closing upon detection of smoke. Doors shall not have air transfer openings and shall not be undercut in excess of the clearance permitted in accordance with NFPA 80 listed in Chapter 35.

302.1.2 Accessory areas: Except for accessory areas of Use Group H in accordance with Section 302.1.2.1 and specific occupancy areas indicated in Section 302.1.1, a *fire separation assembly* shall not be required between the main use group and accessory areas where the aggregate area devoted to all accessory occupancies does not occupy more than 10 percent of any *fire area*; the aggregate area devoted to all accessory uses within a story does not exceed 10 percent of the area of the story; and the aggregate area devoted to an accessory occupancy is not more than 10 percent of the allowable area permitted by Section 503.0 based on the accessory use group. The required type of construction and the *automatic fire suppression* requirements in Section 904.0 shall be based on the main use group of the *fire area.*

302.1.2.1 High-hazard uses: In buildings that are three stories or less in *height* and equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1, an occupancy in Use Group F or S is permitted to have accessory areas of Use Group H-2, H-3 or H-4, provided that such areas do not occupy more than 10 percent of any *fire area*, nor more than 10 percent of the allowable area permitted by Section 503.0 based on the use group of the accessory area. A *fire separation assembly* shall not be required between the F or S use group and the accessory H use group. The maximum quantity of *hazardous materials* within the accessory H use group shall not exceed twice the exempt amounts specified in Table 307.8(1) or Table 307.8(2). The required type of construction shall be based on the main use group of the *fire area.*

302.2 Mixed use: All buildings and structures that include more than one use group shall be further designated as a mixed use and shall comply with Section 313.0. Specific occupancy areas and accessory areas complying with Sections 302.1.1 and 302.1.2, respectively, shall be classified in accordance with the main use group.

SECTION 303.0 ASSEMBLY USE GROUPS

303.1 General: All structures which are designed or occupied for the gathering together of persons for purposes such as civic, social or religious functions, recreation, food or drink consumption or awaiting transportation, shall be classified as Use Group A-1, A-2, A-3, A-4 or A-5. A room or space used for assembly purposes by less than 50 persons and which is accessory to another use group shall be included as a part of that main use group. The term "Use Group A" shall include Use Groups A-1, A-2, A-3, A-4 and A-5.

303.2 Use Group A-1, theaters: This use group shall include all theaters and all other buildings and structures intended for the production and viewing of performing arts or motion pictures; and which are usually provided with fixed seats — including theaters, motion picture theaters and television and radio studios admitting an audience. *Stages* and *platforms* shall comply with Section 412.0.

303.3 Use Group A-2 structures: This use group shall include all buildings and places of public assembly, without theatrical *stage* accessories, designed for occupancy as dance halls, nightclubs and for similar purposes, including all rooms, lobbies and other spaces connected thereto with a common *means of egress* and entrance.

303.4 Use Group A-3 structures: This use group shall include all buildings with or without an auditorium in which persons assemble for amusement, entertainment or recreation purposes, as well as incidental motion picture, dramatic or theatrical presentations, lectures or other similar purposes without theatrical *stage* other than a raised *platform*; and which are principally occupied without permanent seating facilities, including art galleries, exhibition halls, museums, lecture halls, libraries, restaurants other than nightclubs, and recreation centers; and buildings designed for similar assembly purposes, including passenger terminals.

303.5 Use Group A-4 structures: This use group shall include all buildings and structures which are occupied exclusively for the purpose of worship or other religious services.

303.6 Use Group A-5, outdoor assembly: This use group shall include structures utilized for outdoor assembly which are intended for participation in or reviewing activities, including *grandstands* (Section 1013.0), *bleachers* (Section 1013.0), coliseums, stadiums, amusement park structures (Section 413.0) and fair or carnival structures. Such structures shall comply with all pertinent provisions of this code.

SECTION 304.0 BUSINESS USE GROUP

304.1 General: All buildings and structures which are occupied for the transaction of business, for the rendering of professional services, or for other services that involve stocks of goods, wares or merchandise in limited quantities which are incidental to office occupancies or sample purposes, shall be classified as Use Group B.

304.2 List of business occupancies: The occupancies listed in Table 304.2 are indicative of and shall be classified as Use Group B.

Table 304.2
BUSINESS OCCUPANCIES

Airport traffic control towers	Fire stations
Animal hospitals, kennels, pounds	Florists and nurseries
Automobile and other motor vehicle showrooms	Laboratories; testing and research
Banks	Laundries; pickup and delivery stations and self-service
Barber shops	Police stations
Beauty shops	Post offices
Car wash	Print shops
Civic administration	Professional services; attorney, dentist, physician, engineer, etc.
Clinic, outpatient	Radio and television stations
Dry cleaning; pickup and delivery stations and self-service	Telecommunication equipment building
Electronic data processing	

SECTION 305.0 EDUCATIONAL USE GROUP

305.1 General: All structures other than those occupied for business training or vocational training, which accommodate more than five persons for educational purposes through the 12th grade, shall be classified as Use Group E.

Exception: A room or space occupied for educational purposes by less than 50 persons, 5 years of age or more, and which is accessory to another use group shall be classified as a part of the main use group.

305.2 Day care facilities: A day care facility which provides care for more than 16 persons more than $2^1/_2$ years of age for less than 24 hours a day shall be classified as Use Group E. A day care facility with more than 5 and not more than 16 occupants shall be classified as residential care, Occupancy Condition 1. A day care facility with five or less occupants shall be classified as a residential use group.

305.3 Business or vocational training: Structures occupied for business training or vocational training shall be classified in the same use group as the business or vocation taught.

SECTION 306.0 FACTORY AND INDUSTRIAL USE GROUPS

306.1 General: All structures in which occupants are engaged in work or labor in the fabricating, assembling or processing of products or materials, shall be classified as Use Group F-1 or F-2. This includes, among others, factories, assembling plants, industrial laboratories and all other industrial and manufacturing occupancies. The term "Use Group F" shall include Use Groups F-1 and F-2.

306.2 Use Group F-1 structures: Factory and industrial occupancies which are not otherwise classified as low-hazard Use Group F-2, shall be classified as a moderate-hazard factory and industrial occupancy, Use Group F-1. The manufacturing processes listed in Table 306.2 are indicative of and shall be classified as Use Group F-1.

306.3 Use Group F-2 structures: Factory and industrial occupancies which involve the fabrication or manufacturing of noncombustible materials that, during finishing, packing or processing, do not contribute to a significant fire hazard, shall be classified as Use Group F-2. The manufacturing processes listed in Table 306.3 are indicative of and shall be classified as Use Group F-2.

Table 306.2
MODERATE-HAZARD FACTORY AND INDUSTRIAL OCCUPANCIES

Aircraft	Film, photographic
Appliances	Food processing
Athletic equipment	Furniture
Automobiles and other motor vehicles	Hemp and jute products
Bakeries	Laundries
Beverages, alcoholic	Leather and tanneries, excluding enameling or japanning
Bicycles	Machinery
Boat building	Millwork and woodworking, wood distillation
Boiler works	Motion picture and television filming
Brooms or brushes	Musical instruments
Business machines	Optical goods
Cameras and photo equipment	Paper mills or products
Canneries, including food products	Plastic products
Clothing	Printing or publishing
Condensed and powdered milk manufacture	Recreational vehicles
Construction and agricultural machinery	Refuse incinerators
Disinfectants	Shoes
Dry cleaning using other than flammable liquids in cleaning or dyeing operations or other than classified in Section 307.0	Soaps and detergents
Electric light plants and power houses	Sugar refineries
Electrolytic-reducing works	Textile mills, including canvas, cotton cloth, bagging, burlap, carpets and rags
Electronics	Tobacco
Engines, including rebuilding	Trailers
	Upholstery and manufacturing shops

Table 306.3
LOW-HAZARD FACTORY AND INDUSTRIAL OCCUPANCIES

Beverages, nonalcoholic	Gypsum
Brick and masonry	Ice
Ceramic products	Metal fabrication and assembly
Foundries	Special industrial occupancies
Glass products	Water-pumping plants

SECTION 307.0 HIGH-HAZARD USE GROUPS

307.1 General: All structures which are occupied for the manufacturing, processing, generation, storage or other use of *hazardous materials* in excess of the exempt amounts specified in Section 307.8 shall be classified as Use Group H-1, H-2, H-3 or H-4 in accordance with the hazards presented by each material as described in Sections 307.3 through 307.6. The term "Use Group H" shall include Use Groups H-1, H-2, H-3 and H-4.

307.1.1 Information required: Separate floor plans shall be submitted for buildings and structures with an occupancy in Use Group H, identifying the locations of anticipated contents and processes so as to reflect the nature of each occupied portion of every building and structure. A report identifying all *hazardous materials* including, but not limited to, materials representing hazards that are classified in Use Group H to be stored or utilized, shall be submitted and the methods of protection from such hazards shall be indicated on the *construction documents*.

307.2 Definitions: The following words and terms shall, for the purposes of this section and as used elsewhere in this code, have the meanings shown herein.

Aerosol: A product that is dispensed from an *aerosol container* by a propellant.

Aerosol container: Metal cans, glass or *plastic* bottles designed to dispense an *aerosol*. Metal cans shall be limited to a maximum size of 33.8 fluid ounces (1000 ml). Glass or *plastic* bottles shall be limited to a maximum size of 4 fluid ounces (118 ml).

Barricade: A structure that consists of a combination of walls, floor and roof, which is designed to withstand the rapid release of energy in an explosion and which is fully confined, partially vented or fully vented; or other effective method of shielding from *explosive* materials by a natural or artificial barrier.

Boiling point: The temperature at which the vapor pressure of a liquid equals the atmospheric pressure of 14.7 pounds per square inch (psia) or 760 mm of mercury. Where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, for the purposes of this classification, the 10 percent of a distillation performed in accordance with ASTM D86 listed in Chapter 35 shall be used as the boiling point of the liquid.

Closed system: The use of a solid or liquid *hazardous material* in a closed vessel or system that remains closed during normal operations where vapors emitted by the product are not liberated outside of the vessel or system and the product is not exposed to the atmosphere during normal operations; and all uses of *compressed gases*. Examples of closed systems for solids and liquids include product conveyed through a piping system into a closed vessel, system or piece of equipment.

Combustible dusts: Dusts and any similar solid material sufficiently comminuted for suspension in still air which, when so suspended, is capable of self-sustained combustion.

Combustible fibers: Includes readily ignitable and free-burning fibers such as cotton, sisal, henequen, jute, hemp, tow, cocoa fiber, oakum, baled waste, baled wastepaper, kapok, hay, straw, excelsior, Spanish moss and other like material.

Combustible liquids: Any liquids having a *flash point* at or above 100 degrees F. (38 degrees C.) shall be known as Class II or III liquids. Combustible liquids shall be divided into the following classifications:

Class II: Liquids having *flash points* at or above 100 degrees F. (38 degrees C.) and below 140 degrees F. (60 degrees C.).

Class IIIA: Liquids having *flash points* at or above 140 degrees F. (60 degrees C.) and below 200 degrees F. (93 degrees C.).

Class IIIB: Liquids having *flash points* at or above 200 degrees F. (93 degrees C.).

Compressed gas: A gas or mixture of gases as contained having an absolute pressure exceeding 40 psi at 70 degrees F. (276 kPa at 21 degrees C.) or, regardless of the pressure at 70 degrees F. (21 degrees C.), having an absolute pressure exceeding 140 psi at 130 degrees F. (965 kPa at 54 degrees C.); or any liquid material having a vapor pressure exceeding 40 psi absolute at 100 degrees F. (276 kPa at 38 degrees C.) as determined by ASTM D323 listed in Chapter 35.

Control area: Spaces within a building which are enclosed and bounded by exterior walls, *fire walls, fire separation assemblies* and roofs, or a combination thereof, where quantities of *hazardous materials* not exceeding the exempt amounts are stored, dispensed, used or handled.

Corrosive: A chemical that causes visible destruction of, or irreversible *alterations* in, living tissue at the point of contact. A chemical shall be considered a corrosive if, when tested on the intact skin of albino rabbits by the test method described by DOTn 49 CFR; 173 listed in Chapter 35, such chemical destroys or changes irreversibly the structure of the tissue at the point of contact following an exposure period of 4 hours. This term shall not refer to action on inanimate surfaces.

Cryogenic liquids (flammable or oxidizing): Any liquid that has a *boiling point* below -200 degrees F. (-129 degrees C.).

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.

Detached storage building: A separate single-story building, without a *basement* or crawl space, used for the storage of *hazardous materials* and located an approved distance from all structures.

Detonation: An exothermic reaction characterized by the presence of a shock wave in the material which establishes and maintains the reaction. The reaction zone progresses through the material at a rate greater than the velocity of sound. The principal heating mechanism is one of shock compression. *Detonations* have an explosive effect.

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

Explosive: Any chemical compound, mixture or device, the primary or common purpose of which is to function by explosion. The term includes, but is not limited to, dynamite, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord, igniters, and display fireworks, 1.3G (Class B, Special).

The term "explosive" includes any material determined to be within the scope of USC Title 18; Chapter 40 listed in Chapter 35 and also includes any material classified as an explosive other than consumer fireworks, 1.4G (Class C, Common) by the Hazardous Material Regulations of DOTn 49 CFR listed in Chapter 35.

Fireworks

Consumer, 1.4G (Class C, common): Fireworks devices containing limited amounts of pyrotechnic composition designed primarily to produce visible or audible effects by combustion. Fireworks, 1.4G, which comply with the construction, chemical composition and DOTn labeling requirements for fireworks, are not explosive materials for the purpose of this code.

Display, 1.3G (Class B, special): Fireworks devices, which are explosive materials, designed primarily to produce visible or audible effects by combustion, deflagration or detonation.

Fireworks, 1.3G, include, but are not limited to, firecrackers containing more than 2 grains (130 milligrams) of explosive composition, aerial shells containing more than 40 grams of pyrotechnic composition and other display pieces which exceed the limits for classification as consumer fireworks, 1.4G (Class C, Common).

Flammable: Capable of being readily ignited from common sources of heat or at a temperature of 600 degrees F. (316 degrees C.) or less.

Flammable compressed gas: Either a mixture of 13 percent or less (by volume) with air forms a *flammable* mixture, or the *flammable* range with air is wider than 12 percent, regardless of the lower limitation. These limitations shall be determined at atmospheric temperature and pressure.

Flammable liquids: Any liquid that has a *flash point* below 100 degrees F. (38 degrees C.), and has a vapor pressure not exceeding 40 psia (276 kPa) at 100 degrees F. (38 degrees C.). Flammable liquids shall be known as Class I liquids and shall be divided into the following classifications:

Class IA: Liquids having a *flash point* below 73 degrees F. (23 degrees C.) and having a *boiling point* below 100 degrees F. (38 degrees C.).

Class IB: Liquids having a *flash point* below 73 degrees F. (23 degrees C.) and having a *boiling point* at or above 100 degrees F. (38 degrees C.).

Class IC: Liquids having a *flash point* at or above 73 degrees F. (23 degrees C.) and below 100 degrees F. (38 degrees C.).

Flammable solid: A solid, other than a blasting agent or *explosive*, that is capable of causing fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which has an ignition temperature below 212 degrees F. (100 degrees C.) or which burns so vigorously and persistently when ignited as to create a serious hazard. A chemical shall be considered a flammable solid as determined in accordance with the test method of CPSC 16 CFR; 1500.44 listed in Chapter 35, if it ignites and burns with a self-sustained flame at a rate greater than 0.1 inch (3 mm) per second along its major axis.

Flash point: The minimum temperature in degrees Fahrenheit at which a *flammable liquid* will give off sufficient vapors to form an ignitable mixture with air near the surface or in the container, but will not sustain combustion. The flash point of a liquid shall be determined by appropriate test procedure and apparatus as specified in ASTM D56 and ASTM D93 listed in Chapter 35.

Handling: The deliberate transport by any means to a point of storage or use.

Hazardous materials: Those chemicals or substances which are *physical hazards* or *health hazards* as defined and classified in this section and the fire prevention code listed in Chapter 35, whether the materials are in usable or waste condition.

Health hazard: A classification of a chemical for which there is statistically significant evidence that acute or chronic health effects are capable of occurring in exposed persons. The term "health hazard" includes chemicals which are *toxic* or *highly toxic*, *irritants*, *corrosives*, *sensitizers*, or *radioactive*.

Highly toxic: A chemical falling within any of the following categories is considered highly toxic.

1. A chemical that has a median lethal dose (LD_{50}) 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 (LD_{50}) 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 (LC_{50}) 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 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

Incompatible materials: Materials which, when mixed, have the potential to react in a manner that generates heat, fumes, gases or by-products which are hazardous to life or property.

Irritant: A chemical which is not *corrosive*, but which causes a reversible inflammatory effect on living tissue by chemical action at the point of contact. A chemical shall be considered an irritant if, when tested on the intact skin of albino rabbits by the test method of CPSC 16 CFR; 1500.41 listed in Chapter 35 for 4 hours exposure, it results in an empirical score of 5 or more. A chemical is an eye irritant if so determined by the procedure in CPSC 16 CFR; 1500.42 listed in Chapter 35.

Open system: The use of a solid or liquid *hazardous material* in a vessel or system that is continuously open to the atmosphere during normal operations and where vapors are liberated, or the product is exposed to the atmosphere during normal operations. Examples of open systems for solids and liquids include dispensing from or into open beakers or containers, dip tank and plating tank operations.

Organic peroxide: An organic compound that contains the bivalent double-bonded oxygen structure and which is considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms have been replaced by an organic radical.

Unclassified detonable: Organic peroxides which are capable of *detonation*. These peroxides present an extremely high explosion hazard through rapid explosive decomposition.

Class I: Class I organic peroxides are capable of *deflagration*, but not *detonation*. These peroxides present a high explosion hazard through rapid decomposition.

Class II: Class II organic peroxides burn very rapidly and present a severe reactivity hazard.

Class III: Class III organic peroxides burn rapidly and present a moderate reactivity hazard.

Other health-hazard material: A *hazardous material* that affects target organs of the body, which includes, but is not limited to, those materials which cause liver damage, kidney damage or damage to the nervous system; act on the blood to decrease hemoglobin function; deprive the body tissue of oxygen; or affect reproductive capabilities, including muta-

tions (chromosomal damage) or teratogens (effects on fetuses).

Oxidizer: A material that is capable, generally by yielding oxygen, of causing or enhancing the combustion of other materials.

Class 4: An oxidizer that can undergo an explosive reaction due to contamination or exposure to thermal or physical shock. Additionally, the oxidizer will enhance the burning rate and is capable of causing spontaneous ignition of combustibles.

Class 3: An oxidizer that will cause a severe increase in the burning rate of combustible materials with which the oxidizer comes in contact or that will undergo vigorous self-sustained decomposition due to contamination or exposure to heat.

Class 2: An oxidizer that will cause a moderate increase in the burning rate or that is capable of causing spontaneous ignition of combustible materials with which the oxidizer comes in contact.

Class 1: An oxidizer whose primary hazard is a slight increase in the burning rate but which does not cause spontaneous ignition when the oxidizer comes in contact with combustible materials.

Physical hazard: A chemical for which there is evidence in the referenced standards listed in Chapter 35 that it is a *combustible liquid, compressed gas, cryogenic, explosive, flammable* gas, *flammable liquid, flammable solid, organic peroxide, oxidizer, pyrophoric* or *unstable (reactive)* or *water-reactive material.*

Pyrophoric: A material that will spontaneously ignite in air at or below a temperature of 130 degrees F. (54 degrees C.).

Pyrotechnic composition: A chemical mixture that, upon burning, produces visible, brilliant displays, bright lights or sounds.

Radioactive material: Any material or combination of material that spontaneously emits ionizing radiation.

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.

Tires, bulk storage of: Storage of 10,000 or more average-sized passenger vehicle tires weighing approximately 25 pounds (111 N) each (see Section 307.5).

Toxic: A chemical that is within any of the following categories shall be considered toxic:

1. A chemical that has a median lethal dose (LD_{50}) of more than 50 milligrams per kilogram, but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
2. A chemical that has a median lethal dose (LD_{50}) 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 that has a median lethal concentration (LC_{50}) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

Unstable (reactive) material: A material which, in the pure state or as commercially produced, will vigorously polymerize, decompose or condense, become self-reactive, or otherwise undergo a violent chemical change under conditions of shock, pressure or temperature.

Class 4: Materials that in themselves are readily capable of *detonation* or explosive decomposition or explosive reaction at normal temperatures and pressures. This class includes, among others, materials that are sensitive to localized thermal or mechanical shock at normal temperatures and pressures.

Class 3: Materials that in themselves are capable of *detonation* or explosive decomposition or explosive reaction, but that require a strong initiating source or that must be heated under confinement before initiation. This class includes, among others, materials that are sensitive to thermal or mechanical shock at elevated temperatures and pressures.

Class 2: Materials that readily undergo violent chemical change at elevated temperatures and pressures. This class includes, among others, materials that exhibit an exotherm at temperatures less than or equal to 150 degrees C. when tested by differential scanning calorimetry.

Class 1: Materials that in themselves are normally stable, but which can become unstable at elevated temperatures and pressures. This class includes, among others, materials that change or decompose on exposure to air, light or moisture, and materials that exhibit an exotherm at temperatures greater than 150 degrees C., but less than or equal to 300 degrees C., when tested by differential scanning calorimetry.

Water-reactive material: A material which has the potential to become spontaneously *flammable* or to give off *flammable, highly toxic* or *toxic* gases or other gases with a LC_{50} value of 5,000 ppm or less at a rate greater than 1 liter per kilogram of material per hour when tested in accordance with the method described in Section 4 of Appendix E to DOTn 49 CFR; 173 listed in Chapter 35. Class 1 water reactive-materials are not subject to regulation in this code. Water-reactive materials are classified into three groups as follows:

Class 3: A material which reacts vigorously with water at ambient temperatures and generally demonstrates a tendency for gas produced to ignite spontaneously or which reacts readily with water at ambient temperatures such that the rate of evolution of *flammable* or *toxic* gas is equal to or greater than 10 liters per kilogram of material over any 1 minute. In accordance with DOTn 49 CFR; 172 listed in Chapter 35, the classification for these materials is 4.3, Packing Group I.

Class 2: A material which reacts readily with water at ambient temperatures such that the maximum rate of evolution of *flammable* or *toxic* gas is equal to or greater than 20 liters over kilogram of material per hour, and which does not meet the

criteria or Class 3 water-reactive materials. In accordance with DOTn 49 CFR; 172 listed in Chapter 35, the classification for these materials is 4.3, Packing Group II.

Class 1: A material which reacts slowly with water at ambient temperatures such that the maximum rate of evolution of *flammable* or *toxic* gas is greater than 1 liter per kilogram of material per hour, and which does not meet the criteria from Class 2 or 3 water-reactive materials. In accordance with DOTn 49 CFR; 172 listed in Chapter 35, the classification for these materials is 4.3, Packing Group III.

307.3 Use Group H-1 structures: All buildings and structures which contain materials that present a *detonation* hazard, shall be classified as Use Group H-1. Such materials shall include but not be limited to:

Explosives
Organic peroxides, unclassified detonable
Oxidizers, Class 4
Unstable (reactive) materials, Class 3 detonable, and Class 4
Detonable *pyrophoric* materials

307.4 Use Group H-2 structures: All buildings and structures which contain materials that present a *deflagration* hazard or a hazard from accelerated burning, shall be classified as Use Group H-2. Such materials shall include but not be limited to:

Combustible dusts
Combustible liquids, Class II and Class IIIA
Cryogenic liquids, flammable or oxidizing
Flammable gases
Flammable liquids
Organic peroxides, Class I
Oxidizers, Class 3
Oxidizing gases
Pyrophoric liquids, solids and gases, nondetonable
Unstable (reactive) materials, Class 3, nondetonable

307.5 Use Group H-3 structures: All buildings and structures which contain materials that readily support combustion or present a *physical hazard*, shall be classified as Use Group H-3. Such materials shall include but not be limited to:

Aerosols, Level 2 and Level 3
Combustible fibers
Combustible liquids, Class IIIB
Consumer fireworks, 1.4G (Class C, Common)
Flammable solids
Organic peroxides, Class II and III
Oxidizers, Class 1 and Class 2
Tires, bulk storage of
Unstable (reactive) materials, Class 2
Water-reactive materials, Class 2 and Class 3

307.6 Use Group H-4 structures: All buildings and structures which contain materials that are *health hazards*, shall be classified as Use Group H-4. Such materials shall include but not be limited to:

Corrosives
Highly toxic materials
Irritants
Radioactive materials
Sensitizers
Toxic materials

307.7 Multiple hazards: All buildings and structures containing a material or materials representing hazards that are classified in one or more of Use Groups H-1, H-2, H-3 and H-4, shall conform to the code requirements for each of the use groups so classified.

307.8 Exceptions: The following shall not be classified in Use Group H, but shall be classified in the use group which they most nearly resemble. *Hazardous materials* in any quantity shall conform to the requirements of this code, including Section 417.0, and the fire prevention code listed in Chapter 35.

1. All buildings and structures which contain not more than the exempt amounts of *hazardous materials* as shown in Tables 307.8(1) and 307.8(2) provided that such buildings are maintained in accordance with the fire prevention code listed in Chapter 35.
2. Buildings utilizing *control areas* in accordance with Section 417.2 which contain not more than the exempt amounts of *hazardous materials* as shown in Tables 307.8(1) and 307.8(2).
3. Buildings and structures occupied for the storage of 10,000 or more vehicle tires weighing approximately 25 pounds (111 N) each, provided that such buildings are equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1.
4. Buildings and structures occupied for the application of *flammable* finishes, provided that such buildings or areas conform to the requirements of Section 419.0 and NFPA 33, NFPA 34 and the fire prevention code listed in Chapter 35.
5. Rooms containing *flammable liquids* in tightly closed containers of 1-gallon capacity (4 L) or less for private utilization on the premises and in quantities not exceeding 2 gallons per square foot (82 L/m^2) of room area.
6. Wholesale and retail sales and storage of *flammable* and *combustible liquids* in mercantile occupancies conforming to NFPA 30 and the fire prevention code listed in Chapter 35.
7. *Closed systems* housing *flammable* or *combustible liquids* or gases utilized for the operation of machinery or equipment.
8. Cleaning establishments which utilize *combustible liquid* solvents having a *flash point* of 140 degrees F. (60 degrees C.) or higher in *closed systems* employing equipment listed by an *approved testing agency*, provided that this occupancy is separated from all other areas of the building by 1-hour fireresistance rated *fire separation assemblies*.
9. Cleaning establishments which utilize a liquid solvent having a *flash point* at or above 200 degrees F. (93 degrees C.).
10. Liquor stores and distributors without bulk storage.
11. Refrigeration systems.
12. The storage or utilization of materials for agricultural purposes on the premises.
13. Stationary batteries utilized for facility emergency power, uninterrupted power supply or telecommunication facilities provided that the batteries are provided with safety

Table 307.8(1)
EXEMPT AMOUNTS OF HAZARDOUS MATERIALS, LIQUIDS AND CHEMICALS PRESENTING A PHYSICAL HAZARD
MAXIMUM QUANTITIES PER CONTROL AREA[a, m]

Material	Class	Use Group	Storage[b]			Closed systems[b]			Open systems[b]	
			Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas cubic feet	Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas cubic feet	Solid pounds (cubic feet)	Liquid gallons (pounds)
Combustible liquid[c,k]	II IIIA IIIB	H-2 H-2 H-3	Not applicable	120[d,e] 330[d,e] 13,200[e,f]	Not applicable	Not applicable	120[d] 330[d] 13,200[f]	Not applicable	Not applicable	30[d] 80[d] 3,300[f]
Combustible dust pounds per 1,000 cubic feet		H-2	1[g]	Not applicable	Not applicable	1[g]	Not applicable	Not applicable	1[g]	Not applicable
Combustible fiber	Loose Baled	H-3	(100) (1,000)	Not applicable	Not applicable	(100) (1,000)	Not applicable	Not applicable	(20) (200)	Not applicable
Cryogenics, flammable or oxidizing		H-2	Not applicable	45[d]	Not applicable	Not applicable	45[d]	Not applicable	Not applicable	10[d]
Explosives		H-1	1[e,h,i]	(1)[e,h,i]	Not applicable	1/4[h]	(1/4)[h]	Not applicable	1/4[h]	(1/4)[h]
Fireworks, consumer	1.4G	H-3	50[d, l]	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Flammable gas	Gaseous Liquefied	H-2	Not applicable	Not applicable 30[d,e]	1,000[d,e] Not applicable	Not applicable	Not applicable 30[d,e]	750[d,e] Not applicable	Not applicable	Not applicable
Flammable liquid[c]	IA IB IC	H-2	Not applicable	30[d,e] 60[d,e] 90[d,e]	Not applicable	Not applicable	30[d] 60[d] 90[d]	Not applicable	Not applicable	10[d] 15[d] 20[d]
Combination (IA, IB, IC)		H-2	Not applicable	120[d,e,j]	Not applicable	Not applicable	120[d,j]	Not applicable	Not applicable	30[d,j]
Flammable solid		H-3	125[d,e]	Not applicable	Not applicable	25[d]	Not applicable	Not applicable	25[d]	Not applicable
Organic peroxide	UD I II III	H-1 H-2 H-3 H-3	1[e,h] 5[d,e] 50[d,e] 125[d,e]	(1)[e,h] (5)[d,e] (50)[d,e] (125)[d,e]	Not applicable	1/4[h] 1[d] 50[d] 125[d]	(1/4)[h] (1)[d] (50)[d] (125)[d]	Not applicable	1/4[h] 1[d] 10[d] 25[d]	(1/4)[h] (1)[d] (10)[d] (25)[d]
Oxidizer	4 3 2 1	H-1 H-2 H-3 H-3	1[e,h] 10[d,e] 250[d,e] 4,000[d,e]	(1)[e,h] (10)[d,e] (250)[d,e] (4,000)[d,e]	Not applicable	1/4[h] 2[d] 250[d] 4,000[d]	(1/4)[h] (2)[d] (250)[d] (4,000)[d]	Not applicable	1/4[h] 2[d] 50[d] 1,000[d]	(1/4)[h] (2)[d] (50)[d] (1,000)[d]
Oxidizer — gas	Gaseous Liquefied	H-2	Not applicable	Not applicable 15[d,e]	1,500[d,e] Not applicable	Not applicable	Not applicable 15[d,e]	1,500[d,e] Not applicable	Not applicable	Not applicable
Pyrophoric		H-2	4[e,h]	(4)[e,h]	50[e,h]	1[h]	(1)[h]	10[e,h]	0	0
Unstable (reactive)	4 3 2	H-1 H-1 or H-2 H-3	1[e,h] 5[d,e] 50[d,e]	(1)[e,h] (5)[d,e] (50)[d,e]	10[d,h] 50[d,e] 250[d,e]	1/4[h] 1[d] 50[d]	(1/4)[h] (1)[d] (50)[d]	2[e,h] 10[d,e] 250[d,e]	1/4[h] 1[d] 10[d]	(1/4)[h] (1)[d] (10)[d]
Water reactive	3 2	H-3 H-3	5[d,e] 50[d,e]	(5)[d,e] (50)[d,e]	Not applicable	5[d] 50[d]	(5)[d] (50)[d]	Not applicable	1[d] 10[d]	(1)[d] (10)[d]

Note a. For use of control areas, see Section 417.2.

Note b. The aggregate quantity in utilization and storage shall not exceed the quantity listed for storage.

Note c. The quantities of alcoholic beverages in retail sales occupancies shall not be limited, provided the liquids are packaged in individual containers not exceeding 1 gallon. In retail sales and storage occupancies, the quantities of medicines, foodstuffs and cosmetics, containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solutions not being flammable, shall not be limited, provided that such materials are packaged in individual containers not exceeding 1 gallon.

Note d. Maximum quantities shall be increased 100 percent in buildings equipped throughout with an automatic sprinkler system in accordance with Section 906.2.1. Where Note e also applies, the increase for both notes shall be applied accumulatively.

Note e. Maximum quantities shall be increased 100 percent when stored in approved cabinets, gas cabinets, fume hoods, exhausted enclosures, or safety cans as specified in the fire prevention code listed in Chapter 35. Where Note d also applies, the increase for both notes shall be applied accumulatively.

Note f. Quantities shall not be limited in a building equipped throughout with an automatic sprinkler system in accordance with Section 906.2.1.

Note g. A dust explosion potential is considered to exist where 1 pound or more of combustible dust per 1,000 cubic feet of volume is normally in suspension or could be put into suspension in all or a portion of an enclosure or inside pieces of equipment. This also includes combustible dust which accumulates on horizontal surfaces inside buildings or equipment and which could be put into suspension by an accident, sudden force or small explosion.

Note h. Permitted only in buildings equipped throughout with an automatic sprinkler system in accordance with Section 906.2.1.

Note i. One pound of black sporting powder and 20 pounds of smokeless powder are permitted in sprinklered or unsprinklered buildings. The maximum quantities of black sporting and smokeless powder shall be the amounts specified in NFPA 495 where such powder is stored in accordance with NFPA 495 listed in Chapter 35.

Note j. Containing not more than the exempt amounts of Class I-A, Class I-B or Class I-C flammable liquids.

Note k. Inside a building, the maximum capacity of a combustible liquid storage system that is connected to a fuel-oil piping system shall be 660 gallons provided such system conforms to the fire prevention code listed in Chapter 35.

Note l. Net weight of the pyrotechnic composition of the fireworks. Where the net weight of the pyrotechnic composition of the fireworks is not known, 25 percent of the gross weight of the fireworks including packaging shall be used.

Note m. Quantities in parenthesis indicate quantity units in parenthesis at the head of each column. 1 cubic foot = 0.028 m^3; 1 pound = 0.454 kg; 1 gallon = 4 L.

Table 307.8(2)
EXEMPT AMOUNTS OF HAZARDOUS MATERIALS, LIQUIDS AND CHEMICALS PRESENTING A HEALTH HAZARD (USE GROUP H-4) MAXIMUM QUANTITIES PER CONTROL AREA [a, b, i]

Material	Storage[c]			Closed systems[c]			Open systems[c]	
	Solid pounds[d,e]	Liquid gallons (pounds)[d,e]	Gas cubic feet	Solid pounds[d]	Liquid gallons (pounds)[d]	Gas cubic feet	Solid pounds[d]	Liquid gallons (pounds)[d]
Corrosive	5,000	500	810[d,e,h]	5,000	500	810[d,e,h]	1,000	100
Highly toxic	1	(1)	20[f]	1	(1)	20[f]	1/4	(1/4)
Irritant	Not limited	Not limited	810[d,e]	Not limited	Not limited	810[d,e]	Not limited	Not limited
Radioactive[g]	25 rem - unsealed source 100 rem - sealed source			100 rem - sealed source			25 rem - sealed source	
Sensitizer	Not limited	Not limited	810[d,e]	Not limited	Not limited	810[d,e]	Not limited	Not limited
Toxic	500	(500)	810[d,e]	500	(500)	810[d,e]	125	(125)
Other health hazards	Not limited	Not limited	810[d,e]	Not limited	Not limited	810[d,e]	Not limited	Not limited

Note a. For use of control areas, see Section 417.2.

Note b. In retail sales occupancies, the quantities of medicines, foodstuffs and cosmetics, containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solutions not being flammable, shall not be limited, provided that such materials are packaged in individual containers not exceeding 1 gallon.

Note c. The aggregate quantity in utilization and storage shall not exceed the quantity listed for storage.

Note d. Maximum quantities shall be increased 100 percent in buildings equipped throughout with an automatic sprinkler system in accordance with Section 906.2.1. Where Note e also applies, the increase for both notes shall be applied accumulatively.

Note e. Maximum quantities shall be increased 100 percent when stored in approved storage cabinets, gas cabinets, fume hoods, exhausted enclosures, or safety cans as specified in the fire prevention code listed in Chapter 35. Where Note d also applies, the increase for both notes shall be applied accumulatively.

Note f. Permitted only when stored in approved exhausted gas cabinets, exhausted enclosures or fume hoods.

Note g. Maximum dosage permitted in any single exposure.

Note h. A single cylinder containing 150 pounds or less of anhydrous ammonia in a single control area in a nonsprinklered building shall be considered an exempt amount. Two cylinders, each containing 150 pounds or less in a single control area shall be considered an exempt amount provided the building is equipped throughout with an automatic sprinkler system in accordance with Section 906.2.1.

Note i. Quantities in parenthesis indicate quantity units in parenthesis at the head of each column. 1 cubic foot = 0.028 m^3; 1 pound = 0.454 kg; 1 gallon = 4 L.

venting caps and *ventilation* is provided in accordance with the mechanical code listed in Chapter 35.

14. *Corrosives*, *irritants* and *sensitizers* shall not include personal or household products in their original packaging used in retail display or commonly used building materials.
15. Buildings and structures occupied for *aerosol* manufacturing or storage shall be classified as Use Group F-1 or S-1, provided that such buildings conform to the requirements of NFPA 30B and the fire prevention code listed in Chapter 35.
16. Display and storage of nonflammable solid and nonflammable or noncombustible liquid *hazardous materials* in mercantile occupancies in accordance with Section 417.2.1.
17. The storage of Level 2 and Level 3 *aerosol* products in occupancies in Use Groups A, B, E, F, M, I and R provided such occupancies conform to the fire prevention code listed in Chapter 35.

SECTION 308.0 INSTITUTIONAL USE GROUPS

308.1 General: All structures in which people suffering from physical limitations because of health or age are harbored for medical or other care or treatment, or in which people are detained for penal or correction purposes, or in which the liberty of the inmates is restricted, shall be classified as Use Group I-1, I-2 or I-3. The term "Use Group I" shall include Use Groups I-1, I-2 and I-3.

308.2 Use Group I-1: This use group shall include buildings and structures which house more than 16 individuals who, because of age, mental disability or other reasons, must live in a supervised environment but who are physically capable of responding to an emergency situation without personal assistance. Where accommodating persons of the above description, the following types of facilities shall be classified as I-1 facilities: board and care facilities, half-way houses, group homes, social rehabilitation facilities, alcohol and drug centers and convalescent facilities. A facility such as the above with five or less occupants shall be classified as a residential use group. Such a facility with more than 5 and not more than 16 occupants shall be classified as residential care, Occupancy Condition 1.

308.3 Use Group I-2: This use group shall include buildings and structures 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. Where accommodating persons of the above description, the following types of facilities shall be classified as I-2 facilities: hospitals, nursing homes (both intermediate care facilities and skilled nursing facilities), mental hospitals and detoxification facilities. A facility such as the above with five or less occupants shall be classified as a residential use group.

308.3.1 Care facility: A care facility which accommodates, for any length of time, more than 16 occupants $2\frac{1}{2}$ years of age or less or occupants who are not capable of responding to an emergency situation shall be classified as Use Group I-2.

A facility such as the above with more than 5 and not more than 16 occupants shall be classified as residential care, Occupancy Condition 2.

308.4 Use Group I-3: This use group shall include buildings and structures which are inhabited by six or more persons who are under some restraint or security. An I-3 facility is occupied by persons who are generally incapable of self-preservation due to security measures not under the occupants' control. Where accommodating persons of the above description, the following types of facilities shall be classified as I-3 facilities: prisons, jails, reformatories, detention centers, correctional centers and prerelease centers. Buildings of Use Group I-3 shall be classified as one of the occupancy conditions indicated in Sections 308.4.1 through 308.4.5 (see Section 410.0).

308.4.1 Occupancy Condition I: This occupancy condition shall include all buildings in which free movement is allowed from sleeping areas, and other spaces where access or occupancy is permitted, to the exterior via *means of egress* without restraint. An Occupancy Condition I facility shall be classified as Use Group R.

308.4.2 Occupancy Condition II: This occupancy condition shall include all buildings in which free movement is allowed from sleeping areas and any other occupied *smoke compartment* to one or more other *smoke compartments*. Egress to the exterior is impeded by locked *exits*.

308.4.3 Occupancy Condition III: This occupancy condition shall include all buildings in which free movement is allowed within individual *smoke compartments*, such as within a residential unit comprised of individual sleeping rooms and group activity spaces, where egress is impeded by remote-controlled release of *means of egress* from such *smoke compartment* to another *smoke compartment*.

308.4.4 Occupancy Condition IV: This occupancy condition shall include all buildings in which free movement is restricted from an occupied space. Remote-controlled release is provided to permit movement from all sleeping rooms, activity spaces and other occupied areas within the *smoke compartment* to other *smoke compartments*.

308.4.5 Occupancy Condition V: This occupancy condition shall include all buildings in which free movement is restricted from an occupied space. Staff-controlled release is provided to permit movement from all sleeping rooms, activity spaces and other occupied areas within the *smoke compartment* to other *smoke compartments*.

SECTION 309.0 MERCANTILE USE GROUP

309.1 General: All buildings and structures which are occupied for display and sales purposes involving stocks of goods, wares or merchandise incidental to such purposes and open to the public, shall be classified as Use Group M. This includes, among others, retail stores, automotive service stations, shops, salesrooms and markets. An automotive service station is that portion of a property where motor fuels are stored and dispensed from fixed equipment into the fuel tanks of motor vehicles or approved containers, including any building used for the sale of automotive accessories, or for minor automotive repair work. Minor repairs include the exchange of parts, oil changes, engine tune-ups and similar routine maintenance work. Retail sales of *hazardous materials* shall comply with Section 307.8.

SECTION 310.0 RESIDENTIAL USE GROUPS

310.1 General: All structures in which sleeping accommodations are provided, including residential care facilities but excluding those that are classified as institutional occupancies, shall be classified as Use Group R-1, R-2, R-3 or R-4. The term "Use Group R" shall include Use Groups R-1, R-2 and R-3.

310.2 Definitions: The following words and terms shall, for the purposes of this section and as used elsewhere in this code, have the meanings shown herein.

Dwellings

Boarding house: A building arranged or used for lodging for compensation, with or without meals, and not occupied as a single-family unit.

Dormitory: A space in a building where group sleeping accommodations are provided in one room, or in a series of closely associated rooms, for persons not members of the same family group.

Dwelling unit: A single unit providing complete, independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

Multiple-family dwelling: A building or portion thereof containing more than two *dwelling units* and not meeting the requirements for a *multiple single-family dwelling*.

Multiple single-family dwelling: A building or portion thereof containing more than two *dwelling units* (see Section 310.5).

One-family dwelling: A building containing one *dwelling unit* with not more than five lodgers or boarders.

Two-family dwelling: A building containing two *dwelling units* with not more than five lodgers or boarders per family.

Residential care facility: A facility where more than 5 and not more than 16 occupants receive personal care in a supervised environment. A residential care facility shall be classified as Occupancy Condition 1 or 2.

Occupancy Condition 1: This occupancy condition shall include occupants more than $2^1/_2$ years of age who are capable of responding to an emergency situation.

Occupancy Condition 2: This occupancy condition shall include occupants $2^1/_2$ years of age or less or occupants of any age who are not capable of responding to an emergency situation.

310.3 Use Group R-1 structures: This use group shall include all hotels, motels, *boarding houses* and similar buildings arranged for shelter and sleeping accommodations for more than five occupants who are primarily transient in nature, occupying the facilities for a period of less than 30 days.

310.4 Use Group R-2 structures: This use group shall include all *multiple-family dwellings* having more than two *dwelling units*, except as provided for in Section 310.5 for *multiple single-family dwelling units*, and shall also include all *boarding houses* and similar buildings arranged for shelter and sleeping accommodations in which the occupants are primarily not transient in nature. A residential care facility shall be classified as Use Group R-2 or R-3.

310.4.1 Dormitories: A *dormitory* facility which accommodates more than five persons more than $2^1/_2$ years of age shall be classified as Use Group R-2.

310.5 Use Group R-3 structures: This use group shall include all buildings arranged for occupancy as *one-* or *two-family dwelling units*, including not more than five lodgers or boarders per family and *multiple single-family dwellings* where each unit has an independent *means of egress* and is separated by a 2-hour *fire separation assembly* (see Section 709.0).

Exceptions

1. In *multiple single-family dwellings* that are equipped throughout with an approved *automatic sprinkler system* installed in accordance with Section 906.2.1 or 906.2.2, the fireresistance rating of the *dwelling unit* separation shall not be less than 1 hour. *Dwelling unit* separation walls shall be constructed as *fire partitions* (see Section 711.0).
2. In *multiple single-family dwellings* that are equipped throughout with an approved *automatic sprinkler system* installed in accordance with Section 906.2.3, the fireresistance rating between each *dwelling unit* shall not be less than 1 hour and shall be constructed as a *fire partition.*

A residential care facility shall be classified as Use Group R-2 or R-3

310.5.1 Care facilities: A care facility which accommodates five or less occupants of any age shall be classified as Use Group R-3.

310.6 Use Group R-4 structures: This use group shall include all detached *one-* or *two-family dwellings* not more than three stories in *height*, and the *accessory structures* as indicated in the one- and two-family dwelling code listed in Chapter 35. All such structures shall be designed in accordance with the one- and two-family dwelling code listed in Chapter 35 or in accordance with the requirements of this code applicable to Use Group R-3. Where such structures are occupied as a residential care facility, the structure shall meet the requirements of this code applicable to Use Group R-3 residential care facilities.

SECTION 311.0 STORAGE USE GROUPS

311.1 General: All structures which are primarily used for the storage of goods, wares or merchandise shall be classified as Use Group S-1 or S-2. This includes, among others, warehouses, storehouses and freight depots. The quantity of *hazardous materials* in storage shall comply with Section 307.8. The term "Use Group S" shall include Use Groups S-1 and S-2.

311.2 Moderate-hazard storage, Use Group S-1: Buildings occupied for the storage of moderate-hazard contents which are likely to burn with moderate rapidity, but which do not produce either poisonous gases, fumes or *explosives* including, among others, the materials listed in Table 311.2, shall be classified as Use Group S-1. A motor vehicle repair garage is that portion of a property wherein major repairs, such as engine overhauls, painting or body work, are performed on motorized vehicles.

Table 311.2
MODERATE-HAZARD STORAGE OCCUPANCIES

Barns[a]	Linoleum
Bags, cloth, burlap and paper	Livestock shelters[a]
Bamboo and rattan	Lumber yards
Baskets	Motor vehicle repair garages
Belting, canvas and leather	Petroleum warehouses for storage of lubricating oils with a flash point of 200 degrees F. (93.33 degrees C.) or higher
Books and paper in rolls or packs	Photo engraving
Boots and shoes	Public garages (Group 1) and stables
Buttons, including cloth covered, pearl or bone	Silk
Cardboard and cardboard boxes	Soap
Clothing, woolen wearing apparel	Sugar
Cordage	Tobacco, cigars, cigarettes and snuff
Furniture	Upholstering and mattress manufacturing
Furs	Wax candles
Grain silos[a]	
Glue, mucilage, paste and size	
Horn and combs, other than celluloid	
Leather, enameling or japanning	

Note a. For the use group classification where such structures are accessory to a residential occupancy, see Section 312.1.

311.3 Low-hazard storage, Use Group S-2: Low-hazard storage occupancies shall include buildings occupied for the storage of noncombustible materials, and of low-hazard wares that do not ordinarily burn rapidly such as products on wood pallets or in paper cartons without significant amounts of combustible wrappings, but with a negligible amount of *plastic* trim such as knobs, handles or film wrapping. Such occupancies shall be classified as Use Group S-2 including, among others, the materials listed in Table 311.3.

Table 311.3
LOW-HAZARD STORAGE OCCUPANCIES

Asbestos	Gypsum board
Beer or wine up to 12% alcohol in metal, glass or ceramic containers	Inert pigments
Cement in bags	Ivory
Chalk and crayons	Meats
Dairy products in nonwaxed coated paper containers	Metal cabinets
Dry cell batteries	Metal desks with plastic tops and trim
Electrical coils	Metal parts
Electrical motors	Metals
Food products	Mirrors
Foods in noncombustible containers	New empty cans
Fresh fruits and vegetables in nonplastic trays or containers	Oil-filled and other types of distribution transformers
Frozen foods	Open parking structures
Glass	Porcelain and pottery
Glass bottles, empty or filled with noncombustible liquids	Public garages (Group 2)
	Stoves
	Talc and soapstones
	Washers and dryers

SECTION 312.0 UTILITY AND MISCELLANEOUS USE GROUP

312.1 General: Buildings and structures of an accessory character and miscellaneous structures not classified in any specific use group shall be constructed, equipped and maintained to conform to the requirements of this code commensurate with the fire and

life hazard incidental to their occupancy. Use Group U shall include structures that are accessory to a residential occupancy including, but not limited to, those listed in Table 312.1.

Table 312.1
UTILITY AND MISCELLANEOUS OCCUPANCIES

Agricultural buildings	Livestock shelters
Barns	Detached private garages
Carports	Greenhouses
Grain silos	Sheds having a building area less than 2,500 square feet[a]
Stables	

Note a. 1 square foot = 0.093 m^2.

SECTION 313.0 MIXED USE GROUPS

313.1 Two or more use groups: Where a building is occupied by two or more occupancies not included in the same use group, the building or portion thereof shall comply with Section 313.1.1, 313.1.2 or 313.1.3 or with combinations of these sections, except that occupancies in Use Group H shall be separated from occupancies of Use Groups A, E, I, M, R and nonaccessory areas of Use Group B in accordance with Section 313.1.2 or 313.1.3. Buildings that include an open parking structure located beneath an A, B, I, M or R Use Group shall comply with Section 313.1.1, 313.1.2, 313.1.3 or 313.2.

Exception: *Fire areas* of Use Group H-1 shall be in separate and detached buildings and structures in accordance with Section 707.1.1.

313.1.1 Nonseparated use groups: Each portion of the building shall be individually classified as to use. The required type of construction for the building shall be determined by applying the *height* and *area* limitations for each of the applicable use groups to the entire building. The most restrictive type of construction, so determined, shall apply. The other requirements of this code shall apply to each portion of the building based on the use group of that occupancy, except that the most restrictive applicable provisions of Section 403.0 and Chapter 9 shall apply to these nonseparated use groups. A *fire separation assembly* is not required between use groups, except as required by other sections of this code.

313.1.2 Separated use groups: Each portion of the building shall be individually classified in a use group and shall be completely separated from adjacent *fire areas* by *fire separation assemblies* (see Section 709.0) and floor/ceiling assemblies (see Section 713.0) having a fireresistance rating determined in accordance with Table 313.1.2, for the use groups being separated. Each *fire area* shall comply with the code based on the use group of that space. Each *fire area* shall comply with the *height* limitations of Section 503.0 based on the use of that space and the type of construction classification. In each story, the *building area* shall be such that the sum of the ratios of the floor area of each use group divided by the allowable *area* from Section 503.0 for each use group shall not exceed one.

Exception: Where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1, the required fireresistance rating of *fire separation assemblies* separating areas of other than Use Group H, shall be reduced from those indicated in Table 313.1.2 by 1 hour but to not less than 1 hour and to not less than that required by Table 602 for floor construction.

313.1.3 Separate buildings: Each use group shall be considered a separate building where each such use group is completely separated from adjacent use groups by *fire walls* having a fireresistance rating corresponding to that required by Table 602. Each building shall then comply with the provisions of this code applicable to the use group of that building.

313.2 Open parking structures beneath other use groups: Open parking structures constructed under Use Groups A, I, B, M and R shall not exceed the *height* and *area* limitations permitted under Section 406.0. The *height* and *area* of the portion of the building above the open parking structure shall not exceed the limitations in Section 503.0 for the upper use group. The *height*, in both feet and stories, of the portion of the building above the open parking structure shall be measured from *grade plane* and shall include both the open parking structure and the portion of the building above the parking structure.

Fire separation assemblies between the parking occupancy and the upper occupancy shall correspond to the required fireresistance rating prescribed in Table 313.1.2 for the uses involved. The type of construction shall apply to each occupancy individually, except that all structural members — including main bracing within the open parking structure which is necessary to support the upper occupancy — shall be protected with the more restrictive fireresistive assemblies of the occupancies involved as shown in Table 602. *Exit* facilities for the upper occupancy shall conform to Chapter 10 and shall be separated from the parking area by *fire separation walls* having at least a 2-hour fireresistance rating as required by Table 602 and self-closing *doors* complying with Section 717.0. *Means of egress* from the open parking facility shall comply with Section 1010.5.

313.3 Use Group R: In buildings of Type 2C, 3B or 5B construction with an occupancy in Use Group R, the first floor shall not be occupied for use groups other than Use Group R, unless the floor/ceiling assembly and the enclosure walls are protected to afford a 1-hour fireresistance rating and the *exits* from the residential floors are separately enclosed in accordance with the requirements of Chapter 10.

Table 313.1.2
FIRERESISTANCE RATING REQUIREMENTS FOR FIRE SEPARATION ASSEMBLIES BETWEEN FIRE AREAS[a]

NP — Not Permitted
NA — Not Applicable

Use Group	A-1	A-2	A-3	A-4	A-5	B	E	F-1	F-2	H-1	H-2	H-3	H-4	I-1	I-2	I-3	M	R-1	R-2	R-3	S-1	S-2	U[b]
A-1	2	2	2	2	2	2	2	3	2	NP	4	3	2	2	3	3	2	2	2	2	3	2	3
A-2		2	2	2	2	2	2	3	2	NP	4	3	2	3	3	3	2	2	2	2	3	2	3
A-3			2	2	2	2	2	3	2	NP	4	3	2	2	3	3	2	2	2	2	3	2	3
A-4				2	2	2	2	3	2	NP	4	3	2	2	3	3	2	2	2	2	3	2	3
A-5					NA	2	2	3	2	NP	4	3	2	2	3	3	2	2	2	2	3	2	3
B						2	2	3	2	NP	4	3	2	2	3	3	2	2	2	2	3	2	3
E							2	3	2	NP	4	3	2	2	3	3	2	2	2	2	3	2	3
F-1								3	3	NP	4	3	3	3	3	3	3	3	3	3	3	3	3
F-2									2	NP	4	3	2	2	3	3	2	2	2	2	3	2	3
H-1										NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
H-2											4	4	4	4	4	4	4	4	4	4	4	4	4
H-3												3	3	3	3	3	3	3	3	3	3	3	3
H-4													2	2	2	2	2	2	2	2	3	2	3
I-1														2	3	3	2	2	2	2	3	2	3
I-2															3	3	3	3	3	3	3	3	3
I-3																3	3	3	3	3	3	3	3
M																	2	2	2	2	3	2	3
R-1																		2	2	2	3	2	3
R-2																			2	2	3	2	3
R-3																				2	3	2	3
S-1																					3	3	3
S-2																						2	3
U[b]																							3

USE GROUP

Note a. Fireresistance ratings are expressed in hours.
Note b. For requirements for private garages, see Section 407.0.

CHAPTER 5

GENERAL BUILDING LIMITATIONS

SECTION 501.0 GENERAL

501.1 Scope: The provisions of this chapter control the *height* and *area* of all structures hereafter erected, and *additions* to existing structures based on the type of construction, use group, frontage on open space providing exposure protection and access to structures for fire-fighting purposes, and the presence of an *automatic sprinkler system.*

SECTION 502.0 DEFINITIONS

502.1 General: The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

Area, building: The *area* included within surrounding exterior walls (or exterior walls and *fire walls*) exclusive of vent *shafts* and *courts*. Areas of the building not provided with surrounding walls shall be included in the building area if such areas are included within the horizontal projection of the roof or floor above.

Basement: That portion of a building which is partly or completely below grade (see "*Story above grade*").

Grade plane: A reference plane representing the average of finished ground level adjoining the building at all exterior walls. Where the finished ground level slopes away from the exterior walls, the reference plane shall be established by the lowest points within the area between the building and the *lot line* or, where the *lot line* is more than 6 feet (1829 mm) from the building, between the building and a point 6 feet (1829 mm) from the building.

Height

Building: The vertical distance from *grade plane* to the average height of the highest roof surface.

Story: The vertical distance from top to top of two successive tiers of beams or finished floor surfaces; and, for the topmost story, from the top of the *floor finish* to the top of the ceiling joists or, where there is not a ceiling, to the top of the roof rafters.

Equipment platform: See Section 2802.0 for definition.

Mezzanine: An intermediate level or levels between the floor and ceiling of any story with an aggregate floor area of not more than one-third of the area of the room in which the level or levels are located (see Section 505.0).

Story: That portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above (also see "*Mezzanine*").

Story above grade: Any story having its finished floor surface entirely above grade, except that a *basement* shall be considered as a story above grade where the finished surface of the floor above the *basement* is:

1. More than 6 feet (1829 mm) above *grade plane*;
2. More than 6 feet (1829 mm) above the finished ground level for more than 50 percent of the total building perimeter; or
3. More than 12 feet (3658 mm) above the finished ground level at any point.

SECTION 503.0 GENERAL HEIGHT AND AREA LIMITATIONS

503.1 General: The *heights* and *areas* of all buildings and structures between exterior walls or between exterior walls and *fire walls* shall be governed by the type of construction and the use group classification as defined in Chapters 3 and 6 and shall not exceed the limitations fixed in Table 503, except as specifically modified by this chapter and the following sections:

Section	Subject
402.7	Covered mall buildings
403.3.3.1	High-rise buildings
414.2	Airport traffic control towers
416.3	HPM facilities
418.3.1.1	Grain elevators
3103.3.5	Membrane structures

503.1.1 Open parking structures: Open parking structures shall conform to the *height* and *area* limitations specified in Section 406.4.

503.1.2 Buildings on same lot: Two or more buildings on the same *lot* shall be regulated as separate buildings or shall be considered as portions of one building if the *height* of each building and the aggregate *area* of all buildings are within the limitations of Table 503 as modified by Sections 504.0 and 506.0. The provisions of this code applicable to the aggregate building shall be applicable to each building.

503.1.3 Type 1 construction: Buildings of Type 1 construction which are permitted to be of unlimited tabular *heights* and *areas* by Table 503, are not subject to the special requirements that allow increased *heights* and *areas* for other types of construction.

Table 503
HEIGHT AND AREA LIMITATIONS OF BUILDINGS
Height limitations of buildings (shown in upper figure as stories and feet above grade plane)[m], and area limitations of one- or two-story buildings facing on one street or public space not less than 30 feet wide (shown in lower figure as area in square feet per floor[m]). See Note a.

Use Group	Note a	Type of construction									
		Noncombustible					Noncombustible/Combustible			Combustible	
		Type 1		Type 2			Type 3		Type 4	Type 5	
		Protected Note b		Protected		Unprotected	Protected	Unprotected	Heavy timber	Protected	Unprotected
		1A	1B	2A	2B	2C	3A	3B	4	5A	5B
A-1	Assembly, theaters	Not limited	Not limited	5 St. 65′ 19,950	3 St. 40′ 13,125	2 St. 30′ 8,400	3 St. 40′ 11,550	2 St. 30′ 8,400	3 St. 40′ 12,600	1 St. 20′ 8,925	1 St. 20′ 4,200
A-2	Assembly, nightclubs and similar uses	Not limited	Not limited 7,200	3 St. 40′ 5,700	2 St. 30′ 3,750	1 St. 20′ 2,400	2 St. 30′ 3,300	1 St. 20′ 2,400	2 St. 30′ 3,600	1 St. 20′ 2,550	1 St. 20′ 1,200
A-3	Assembly — Lecture halls, recreation centers, terminals, restaurants other than nightclubs	Not limited	Not limited	5 St. 65′ 19,950	3 St. 40′ 13,125	2 St. 30′ 8,400	3 St. 40′ 11,550	2 St. 30′ 8,400	3 St. 40′ 12,600	1 St. 20′ 8,925	1 St. 20′ 4,200
A-4	Assembly, churches	Note c	Not limited	Not limited	5 St. 65′ 34,200	3 St. 40′ 22,500	2 St. 30′ 14,400	3 St. 40′ 19,800	2 St. 30′ 14,400	3 St. 40′ 21,600	1 St. 20′ 15,300	1 St. 20′ 7,200
B	Business		Not limited	Not limited	7 St. 85′ 34,200	5 St. 65′ 22,500	3 St. 40′ 14,400	4 St. 50′ 19,800	3 St. 40′ 14,400	5 St. 65′ 21,600	3 St. 40′ 15,300	2 St. 30′ 7,200
E	Educational	Note c	Not limited	Not limited	5 St. 65′ 34,200	3 St. 40′ 22,500	2 St. 30′ 14,400	3 St. 40′ 19,800	2 St. 30′ 14,400	3 St. 40′ 21,600	1 St. 20′ 15,300 Note d	1 St. 20′ 7,200 Note d
F-1	Factory and industrial, moderate		Not limited	Not limited	6 St. 75′ 22,800	4 St. 50′ 15,000	2 St. 30′ 9,600	3 St. 40′ 13,200	2 St. 30′ 9,600	4 St. 50′ 14,400	2 St. 30′ 10,200	1 St. 20′ 4,800
F-2	Factory and industrial, low	Note h	Not limited	Not limited	7 St. 85′ 34,200	5 St. 65′ 22,500	3 St. 40′ 14,400	4 St. 50′ 19,800	3 St. 40′ 14,400	5 St. 65′ 21,600	3 St. 40′ 15,300	2 St. 30′ 7,200
H-1	High hazard, detonation hazards	Notes e, i, k, l	1 St. 20′ 16,800	1 St. 20′ 14,400	1 St. 20′ 11,400	1 St. 20′ 7,500	1 St. 20′ 4,800	1 St. 20′ 6,600	1 St. 20′ 4,800	1 St. 20′ 7,200	1 St. 20′ 5,100	Not permitted
H-2	High hazard, deflagration hazards	Notes e, i, j, l	5 St. 65′ 16,800	3 St. 40′ 14,400	3 St. 40′ 11,400	2 St. 30′ 7,500	1 St. 20′ 4,800	2 St. 30′ 6,600	1 St. 20′ 4,800	2 St. 30′ 7,200	1 St. 20′ 5,100	Not permitted
H-3	High hazard, physical hazards	Notes e, l	7 St. 85′ 33,600	7 St. 85′ 28,800	6 St. 75′ 22,800	4 St. 50′ 15,000	2 St. 30′ 9,600	3 St. 40′ 13,200	2 St. 30′ 9,600	4 St. 50′ 14,400	2 St. 30′ 10,200	1 St 20′ 4,800
H-4	High hazard, health hazards	Notes e, l	7 St. 85′ Not limited	7 St. 85′ Not limited	7 St. 85′ 34,200	5 St. 65′ 22,500	3 St. 40′ 14,400	4 St. 50′ 19,800	3 St. 40′ 14,400	5 St. 65′ 21,600	3 St. 40′ 15,300	2 St. 30′ 7,200
I-1	Institutional, residential care		Not limited	Not limited	9 St. 100′ 19,950	4 St. 50′ 13,125	3 St. 40′ 8,400	4 St. 50′ 11,550	3 St. 40′ 8,400	4 St. 50′ 12,600	3 St. 40′ 8,925	2 St. 35′ 4,200
I-2	Institutional, incapacitated		Not limited	Not limited	4 St. 50′ 17,100	2 St. 30′ 11,250	1 St. 20′ 7,200	1 St. 20′ 9,900	Not permitted	1 St. 20′ 10,800	1 St. 20′ 7,650	Not permitted
I-3	Institutional, restrained		Not limited	Not limited	4 St. 50′ 14,250	2 St. 30′ 9,375	1 St. 20′ 6,000	2 St. 30′ 8,250	1 St. 20′ 6,000	2 St. 30′ 9,000	1 St. 20′ 6,375	Not permitted
M	Mercantile		Not limited	Not limited	6 St. 75′ 22,800	4 St. 50′ 15,000	2 St. 30′ 9,600	3 St. 40′ 13,200	2 St. 30′ 9,600	4 St. 50′ 14,400	2 St. 30′ 10,200	1 St. 20′ 4,800
R-1	Residential, hotels		Not limited	Not limited	9 St. 100′ 22,800	4 St. 50′ 15,000	3 St. 40′ 9,600	4 St. 50′ 13,200	3 St. 40′ 9,600	4 St. 50′ 14,400	3 St. 40′ 10,200	2 St. 35′ 4,800
R-2	Residential, multiple-family		Not limited	Not limited	9 St. 100′ 22,800	4 St. 50′ 15,000 Note f	3 St. 40′ 9,600	4 St. 50′ 13,200 Note f	3 St. 40′ 9,600	4 St. 50′ 14,400	3 St. 40′ 10,200	2 St. 35′ 4,800
R-3	Residential, one- and two-family and multiple single-family		Not limited	Not limited	4 St. 50′ 22,800	4 St. 50′ 15,000	3 St. 40′ 9,600	4 St. 50′ 13,200	3 St. 40′ 9,600	4 St. 50′ 14,400	3 St. 40′ 10,200	2 St. 35′ 4,800
S-1	Storage, moderate		Not limited	Not limited	5 St. 65′ 19,950	4 St. 50′ 13,125	2 St. 30′ 8,400	3 St. 40′ 11,550	2 St. 30′ 8,400	4 St. 50′ 12,600	2 St. 30′ 8,925	1 St. 30′ 4,200
S-2	Storage, low	Note g	Not limited	Not limited	7 St. 85′ 34,200	5 St. 65′ 22,500	3 St. 40′ 14,400	4 St. 50′ 19,800	3 St. 40′ 14,400	5 St. 65′ 21,600	3 St. 40′ 15,300	2 St. 30′ 7,200
U	Utility, miscellaneous		Not limited	Not limited	5 St. 65′ 19,950	4 St. 50′ 13,125	2 St. 30′ 8,400	3 St. 40′ 11,550	2 St. 30′ 8,400	4 St. 50′ 12,600	2 St. 30′ 8,925	1 St. 20′ 4,200

Note a. See the following sections for general exceptions to Table 503:
Section 504.2 Allowable height increase due to automatic sprinkler system installation.
Section 506.2 Allowable area increase due to street frontage.
Section 506.3 Allowable area increase due to automatic sprinkler system installation.
Section 506.4 Allowable area reduction for multistory buildings.
Section 507.0 Unlimited area one-story buildings.

Note b. Buildings of Type 1 construction permitted to be of unlimited tabular heights and areas are not subject to special requirements that allow increased heights and areas for other types of construction (see Section 503.1.3).

Note c. For height exceptions for auditoriums in occupancies in Use Groups A-4 and E, see Section 504.3.

Note d. For height exceptions for day care centers in buildings of Type 5 construction, see Section 504.4.

Note e. For exceptions to height and area limitations for buildings with occupancies in Use Group H, see Chapter 4 governing the specific use groups.

Note f. For exceptions to height of buildings with occupancies in Use Group R-2 of Types 2B and 3A construction, see Sections 504.6 and 504.7.

Note g. For height and area exceptions for open parking structures, see Section 406.0.

Note h. For exceptions to height and area limitations for special industrial occupancies, see Section 507.1.

Note i. Occupancies in Use Groups H-1 and H-2 shall not be permitted below grade.

Note j. Rooms and areas of Use Group H-2 containing pyrophoric materials shall not be permitted in buildings of Type 3, 4 or 5 construction.

Note k. Occupancies in Use Group H-1 are required to be detached one-story buildings (see Section 707.1.1).

Note l. For exceptions to height for buildings with occupancies in Use Group H, see Section 504.5.

Note m. 1 foot = 304.8 mm; 1 square foot = 0.093 m^2.

503.2 Area limitations: The *area* limitations specified in Table 503 shall apply to the maximum horizontally projected *area* of all buildings fronting on a street or a public space not less than 30 feet (9144 mm) in width with access from a public street.

503.3 Height limitations: The *height* in feet and the number of *stories above grade* specified in Table 503 shall apply to all buildings and to all separate parts of a building that are enclosed within *fire walls* complying with the provisions of Chapter 7. A *basement* shall be considered as a *story above grade* where the finished surface of the floor above the *basement* is more than 6 feet (1829 mm) above *grade plane*; or more than 6 feet (1829 mm) above the finished ground level for more than 50 percent of the total building perimeter; or more than 12 feet (3658 mm) above the finished ground level at any point.

SECTION 504.0 HEIGHT MODIFICATIONS

504.1 General: The provisions of this section shall modify the *height* limitations of Table 503 as herein specified.

504.2 Automatic sprinkler systems: Where a building is equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1, the building *height* limitation specified in Table 503 shall be increased one story and 20 feet (6096 mm). The building *height* limitations for buildings with an occupancy in Use Group R specified in Table 503 shall be increased one story and 20 feet (6096 mm) but not to exceed a *height* of four stories and 60 feet (18288 mm) where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 906.2.2 and the system is supervised in accordance with Section 924.1, method 1.

Exception: The *automatic sprinkler system* height increase shall not apply to any of the following conditions:

1. Buildings with an occupancy in Use Group H-1.
2. A *fire area* with an occupancy in Use Group H-2 or H-3.
3. Buildings of Types 2C, 3A, 4 and 5A construction with an occupancy in Use Group I-2.

504.3 Auditoriums: The maximum *height* of auditoriums in Use Groups A-4 and E shall be 65 feet (19812 mm) in buildings of Type 2B, 3A, 4 or 5A construction and 45 feet (13716 mm) in buildings of Type 2C, 3B or 5B construction.

504.4 Day care centers: The *height* limitations of Table 503 for day care centers classified as Use Group E, in buildings of Type 5 construction, shall be increased one story and 20 feet (6096 mm) provided that the total occupant load is less than 50 persons.

504.5 High-hazard use groups: Buildings and structures with an occupancy in Use Group H that requires unusual *heights* necessary to accommodate special manufacturing processes and equipment shall be exempt from the tabular *height* limitations, in feet, of Table 503.

504.6 Type 3A construction: The *height* limitation for buildings of Type 3A construction with occupancies in Use Group R-2 shall be increased to six stories and 75 feet (22860 mm) where the first floor construction above the *basement* has a fire-resistance rating of not less than 3 hours and the floor *area* is subdivided by 2-hour fireresistance rated *fire walls* into *fire areas* of not more than 3,000 square feet (279 m^2).

504.7 Type 2B construction: The *height* limitation for buildings of Type 2B construction with occupancies in Use Group R-2 shall be increased to nine stories and 100 feet (30480 mm) where the building is separated by not less than 50 feet (15240 mm) from any other building on the *lot* and from *interior lot lines*, the *exits* are segregated in a *fire area* enclosed by a 2-hour fireresistance rated *fire wall* and the first floor construction has a fireresistance rating of not less than $1^1/_2$ hours.

SECTION 505.0 MEZZANINES

505.1 General: A *mezzanine* or *mezzanines* in compliance with this section shall be considered a portion of the floor below. Such *mezzanines* shall not contribute to the *building area* as regulated by Section 503.2. Such *mezzanines* shall not contribute to the number of stories as regulated by Section 503.3. The area of the *mezzanine* shall be included in determining the *fire area*.

Exception: See Section 2803 for Equipment Platforms in industrial occupancies.

505.2 Area limitation: The aggregate area of a *mezzanine* or *mezzanines* within a room shall not exceed one-third of the area of that room. The enclosed portions of rooms shall not be included in a determination of the size of the room in which the *mezzanine* is located. In determining the allowable *mezzanine* area, the area of the *mezzanine* shall not be included in the area of the room.

Exceptions

1. The aggregate area of *mezzanines* in buildings and structures of Type 1 or 2 construction for special industrial occupancies shall not exceed two-thirds of the area of that room.
2. The combined aggregate area of mezzanines and equipment platforms shall conform to Section 2804.2.2.

505.3 Egress: Each occupant of a *mezzanine* shall have access to at least two independent *means of egress* where such spaces require two *means of egress* in accordance with Section 1017.2. Where a *stairway* provides a means of *exit access* from a *mezzanine*, the maximum travel distance required by Section 1017.2 shall be measured to the bottom of the *stairway*.

505.4 Openness: A *mezzanine* shall be open and unobstructed to the room in which such *mezzanine* is located except for walls not more than 42 inches (1067 mm) high, columns and posts.

Exceptions

1. *Mezzanines* or portions thereof are not required to be open to the room in which the *mezzanines* are located, provided that the occupant load of the aggregate area of the enclosed space does not exceed 10.
2. A *mezzanine* having two or more *means of egress* is not required to be open to the room in which the *mezzanine* is located, if at least one of the *means of egress* provides direct access to an *exit* from the *mezzanine* level.

SECTION 506.0 AREA MODIFICATIONS

506.1 General: The provisions of this section shall modify the *area* limitations of Table 503 as herein specified.

506.2 Street frontage increase: Where a building or structure has more than 25 percent of the building perimeter fronting on a

street or other unoccupied space, the *area* limitations specified in Table 503 shall be increased 2 percent for each 1 percent of such excess frontage. The unoccupied space shall be on the same *lot* or dedicated for public use, shall not be less than 30 feet (9144 mm) in width and shall have access from a street by a posted fire lane not less than 18 feet (5486 mm) in width.

506.3 Automatic sprinkler system: Where a building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 906.2.1, the *area* limitation specified in Table 503 shall be increased 200 percent for one- and two-story buildings and 100 percent for buildings more than two stories in *height*.

Exceptions

1. The *automatic sprinkler system* increase shall not apply to buildings with an occupancy in Use Group H-1.
2. The *automatic sprinkler system* increase shall not apply to any *fire area* with an occupancy in Use Group H-2 or H-3.

506.4 Multistory buildings: The *area* limitations for buildings two stories in *height* shall be the same as the *area* limitations provided in Table 503 for one-story buildings. In buildings over two stories in *height*, the *area* limitations of Table 503 for one-story buildings shall be reduced as specified in Table 506.4.

Table 506.4
REDUCTION OF AREA LIMITATIONS

Number of stories	Type of construction		
	1A & 1B	2A	2B, 2C, 3A, 3B, 4, 5A, 5B
1	None	None	None
2	None	None	None
3	None	5%	20%
4	None	10%	20%
5	None	15%	30%
6	None	20%	40%
7	None	25%	50%
8	None	30%	60%
9	None	35%	70%
10	None	40%	80%

SECTION 507.0 UNLIMITED AREAS

507.1 One-story buildings: For Use Groups A-3, B, F-1, F-2, I-2, M, S-1 and S-2 and for motion picture theaters, the *area* of buildings that do not exceed one story and 85 feet (25908 mm) in *height*, other than buildings of Type 5 construction, shall not be limited, provided that the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1; and the building is isolated as specified in Section 507.2. Buildings with an occupancy in Use Group I-2 shall not be constructed of Type 3B construction. *Fire areas* of Use Group E are permitted in unlimited area buildings in accordance with Section 507.1.1. *Fire areas* of Use Groups H-2, H-3 and H-4 are permitted in unlimited area buildings in accordance with Section 507.1.2.

Exceptions

1. Buildings and structures of special industrial occupancies shall be exempt from the above *height* limitations and *fire separation distance* requirements, and the *automatic fire suppression system* shall not be provided where such installations will be detrimental or dangerous to the specific occupancy as approved by the code official. Where located with a *fire separation distance* of less than 30 feet (9144 mm), the exterior walls of such buildings shall be *protected* or constructed to provide a fireresistance rating of not less than 2 hours.
2. An *automatic fire suppression system* shall not be required for buildings of Type 2 or Type 4 construction which are occupied exclusively for the storage of noncombustible materials that are not packed or crated in combustible materials.
3. Buildings and structures of Types 1 and 2 construction for rack storage facilities which do not have access by the public shall not be limited in *height* provided that such buildings conform to the requirements of Section 507.1 and NFPA 231C listed in Chapter 35.
4. The *automatic sprinkler system* shall not be required in areas occupied for indoor participant sports, such as tennis, skating, swimming and equestrian activities, in occupancies in Use Group A-3 provided that:
   4.1. *Exit* doors directly to the outside are provided for all occupants of the participant sport areas; and
   4.2. The building is equipped with a fire alarm system with manual fire alarm boxes installed in accordance with Section 918.0.
5. The *automatic fire suppression system* shall not be required for buildings of Type 2 or Type 4 construction classified as agricultural buildings.
6. Buildings and structures serving as aircraft hangers classified as Use Group F-1, F-2, S-1 or S-2 shall be exempt from the above height limitation and be permitted to be 125 feet (38.1 m) in height where approved and listed underwing fire protection equipment capable of serving the entire hanger floor is installed in addition to and independent of the automatic sprinkler system.

507.1.1 School buildings: For occupancies in Use Group E, one-story buildings of Type 2, 3A or 4 construction shall not be limited in *area* where a direct *exit* to the outside of the building is provided from each classroom and the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1. Exterior walls on all sides of such buildings shall comply with Section 507.2.

507.1.2 High-hazard use groups: Use Group H-2, H-3 and H-4 *fire areas* shall be permitted in unlimited area buildings having occupancies in Use Groups F and S, in accordance with the limitations of this section. *Fire areas* located at the perimeter of the unlimited area building shall not exceed 10 percent of the area of the building nor the area limitations specified in Table 503 as modified by Section 506.2, based upon the percentage of the perimeter of the *fire area* that fronts on a street or other unoccupied space. Other *fire areas* shall not exceed 25 percent of the area limitations specified in Table 503. Fireresistance rating requirements of *fire separation assemblies* shall be in accordance with Table 313.1.2.

507.2 Exterior walls: The minimum fireresistance rating of exterior walls of one-story buildings of unlimited *area* shall be determined by the use group and the *fire separation distance* as

specified in Table 507.2, but shall not be less than the fire-resistance rating required by Table 602 for the type of construction. The entire perimeter of one-story unlimited *area* buildings shall have a minimum *fire separation distance* of 30 feet (9144 mm).

Exception: The minimum *fire separation distance* of 30 feet (9144 mm) shall not apply to a wall facing another building on the same *lot*, provided that:

1. Such wall is constructed as a *fire wall* in accordance with Section 707.0;
2. The length of the *fire wall* does not exceed 25 percent of the total perimeter of the unlimited area building;
3. The adjacent building has a minimum *fire separation distance* of 30 feet (9144 mm) on all sides, except for the side that faces the unlimited area building;
4. The adjacent building is equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1; and
5. A building exceeding one story in *height* adjacent to the unlimited area building shall not contain an occupancy in Use Group H-2 or H-3.

507.2.1 Opening protectives: Openings in exterior walls required by Table 507.2 to have a fireresistance rating of 3 hours or more shall be *protected* with fire assemblies having a fireresistance rating of not less than 3 hours. Openings in exterior walls required by Table 507.2 to have a fireresistance rating of 2 hours shall be *protected* with fire assemblies having a fire protection rating of not less than $1^1/_2$ hours.

Table 507.2
MINIMUM FIRERESISTANCE RATING OF EXTERIOR WALLS

Use Group	Fireresistance rating (hours) based on fire separation distance[a]	
	30 feet or greater but less than 50 feet	50 feet or greater
E	$1^1/_2$	0
A-3, B, F-2, I-2, S-2	2	0
F-1, M, S-1	3	0

Note a. 1 foot = 304.8 mm.

CHAPTER 6

TYPES OF CONSTRUCTION

SECTION 601.0 GENERAL

601.1 Scope: The provisions of this chapter shall control the classification of all buildings as to type of construction.

601.2 Application of other laws: The provisions of this chapter shall not be deemed to nullify any provisions of the *zoning* law or any other statute of the jurisdiction pertaining to the location or type of construction of buildings, except as is specifically required by the provisions of this code.

SECTION 602.0 CONSTRUCTION CLASSIFICATION

602.1 General: All buildings and structures erected or to be erected, altered or extended in *height* or *area* shall be classified in one of the five construction types defined in Table 602 and Sections 603.0 through 606.0.

602.2 False designation: A building shall not be designated as a given type of construction unless it conforms to the minimum requirements for that type.

602.3 Minimum requirements: Where a type of construction is used that is superior to the minimum herein required for any specified use, *height* and *area* of the building, nothing in this code shall be construed to require full compliance with the specifications for the higher type; however, the designated construction classification of the building shall be that of the lesser type, unless all of the requirements for the higher type are fulfilled.

602.4 Noncombustibility requirements: Where a structure or a part of a structure is required to be constructed of noncombustible construction, the use of combustible elements shall be permitted subject to the limitations of this section without altering the construction classification.

602.4.1 Building components: Combustible elements shall be permitted to be used for the following building components:

1. Interior finish and trim materials as regulated by Sections 803.0, 804.0 and 806.0.
2. Light-transmitting *plastics* as permitted by Chapter 26.
3. Fireretardant-treated wood complying with Section 2310.0 as permitted by Table 602.
4. Mastics and caulking materials applied to provide flexible seals between components of exterior wall construction.
5. Roof covering materials as regulated by Chapter 15.
6. Thermal and sound insulation as permitted by Sections 707.5, 723.0, 1509.0, 2309.4 and 2603.0.
7. Exterior veneer and trim as permitted by Section 1407.0.
8. Nailing or furring strips as permitted by Section 804.0.
9. Windows and doors as permitted by Section 706.4.
10. Heavy timber as permitted by Sections 1006.3.1, 715.2 and 715.4.
11. Partitions as permitted by Section 603.2.
12. Roof structures as permitted by Section 1510.0.
13. Platforms as permitted by Section 412.4.1.
14. Aggregates, component materials, and admixtures as permitted by Section 701.3.1.
15. Sprayed cementitious and mineral fiber fireresistive materials installed to comply with Section 1705.12.
16. Materials used to protect joints in fireresistance rated assemblies in accordance with Section 709.7.
17. Materials used to protect penetrations in fireresistance rated assemblies in accordance with Section 714.0.

602.4.2 Ducts and plenums: Nonmetallic ducts and materials exposed within plenums shall be permitted in accordance with the mechanical code listed in Chapter 35.

602.4.3 Piping: The use of combustible piping materials is permitted in accordance with the mechanical and plumbing codes listed in Chapter 35.

602.4.4 Electrical: The use of insulated electrical wiring and related components is permitted in accordance with NFPA 70 listed in Chapter 35.

SECTION 603.0 TYPES 1 AND 2 CONSTRUCTION

603.1 General: Buildings and structures of Types 1 and 2 construction are those in which the walls, partitions, structure elements, floors, ceilings, roofs and *exits* are constructed of approved noncombustible materials. Each structure element shall not be less than the required fireresistance rating specified in Table 602, except as otherwise specifically provided for in this code. Buildings of Types 1 and 2 construction shall be further classified as Type 1A, 1B, 2A, 2B or 2C. Fireretardant-treated wood shall only be used as specified in Table 602 and Section 2310.0.

603.2 Interior partitions: In buildings or structures of Types 1, 2A and 2B construction, partitions of a single thickness of wood or approved composite panels, and glass or other approved materials of similar combustible characteristics, are permitted to subdivide rooms or spaces into offices, entries or other similar compartments in all occupancies other than Use Groups I and R,

Table 602
FIRERESISTANCE RATINGS OF STRUCTURE ELEMENTS[k]

Structure element (Note a)		Type of construction Section 602.0									
		Noncombustible					Noncombustible/Combustible			Combustible	
		Type 1 Section 603.0		Type 2 Section 603.0			Type 3 Section 604.0		Type 4 Section 605.0	Type 5 Section 606.0	
		Protected		Protected		Unprotected	Protected	Unprotected	Heavy timber Note c	Protected	Unprotected
		1A	1B	2A	2B	2C	3A	3B	4	5A	5B
1 Exterior walls	Loadbearing	4	3	2	1	0	2	2	2	1	0
	Nonloadbearing	← Not less than the fireresistance rating based on fire separation distance (see Section 705.2) →									
2 Fire walls and party walls (Section 707.0)		4	3	2	2	2	2	2	2	2	2
		← Not less than the fireresistance rating required by Table 707.1 →									
3 Fire separation assemblies (Section 709.0)	Fire enclosure of exits (Sections 1014.11, 709.0 and Note b)	2	2	2	2	2	2	2	2	2	2
	Shafts (other than exits) and elevator hoistways (Sections 709.0, 710.0 and Note b)	2	2	2	2	2	2	2	2	1	1
	Mixed use and fire area separations (Section 313.0)	← Not less than the fireresistance rating required by Table 313.1.2 →									
	Other separation assemblies (Note i)	1	1	1	1	1	1	1	1	1	1
		← Note d →									
4 Fire partitions (Section 711.0)	Exit access corridors (Note g)	← Not less than the fireresistance rating required by Section 1011.4 →									
		← Note d →									
	Tenant spaces separations (Note f)	1	1	1	1	0	1	0	1	1	0
		← Note d →									
5 Dwelling unit and guestroom separations (Sections 711.0, 713.0 and Notes f and j)		1	1	1	1	1	1	1	1	1	1
		← Note d →									
6 Smoke barriers (Section 712.0 and Note g)		1	1	1	1	1	1	1	1	1	1
7 Other nonloadbearing partitions		0	0	0	0	0	0	0	0	0	0
		← Note d →									
8 Interior loadbearing walls, loadbearing partitions, columns, girders, trusses (other than roof trusses) and framing (Section 716.0)	Supporting more than one floor	4	3	2	1	0	1	0	see Sec. 605.0	1	0
	Supporting one floor only or a roof only	3	2	1½	1	0	1	0	see Sec. 605.0	1	0
9 Structural members supporting wall (Section 716.0 and Note g)		3	2	1½	1	0	1	0	1	1	0
		← Not less than fireresistance rating of wall supported →									
10 Floor construction including beams (Section 713.0 and Note h)		3	2	1½ Note l	1	0	1	0	see Sec. 605.0 Note c	1	0
11 Roof construction, including beams, trusses and framing, arches and roof deck (Section 715.0 and Notes e, m)	15′ or less in height to lowest member	2	1½	1	1	0	1	0	see Sec. 605.0 Note c	1	0
				← Note d →							
	More than 15′ but less than 20′ in height to lowest member	1	1	1	0	0	0	0	see Sec. 605.0	1	0
		← Note d →									
	20′ or more in height to lowest member	0	0	0	0	0	0	0	see Sec. 605.0	0	0
		← Note d →									

Note a. For fireresistance rating requirements for structural members and assemblies which support other fireresistance rated members or assemblies, see Section 716.1.

Note b. For reductions in the required fireresistance rating of exit and shaft enclosures, see Sections 1014.11 and 710.3.

Note c. For substitution of other structural materials for timber in Type 4 construction, see Section 2304.2.

Note d. For fireretardant-treated wood permitted in roof construction and nonloadbearing walls where the required fireresistance rating is 1 hour or less, see Sections 603.2 and 2310.0.

Note e. For permitted uses of heavy timber in roof construction in buildings of Types 1 and 2 construction, see Section 715.4.

Note f. For reductions in required fireresistance ratings of tenant separations and dwelling unit separations, see Sections 1011.4 and 1011.4.1.

Note g. For exceptions to the required fireresistance rating of construction supporting exit access corridor walls, tenant separation walls in covered mall buildings, and smoke barriers, see Sections 711.4 and 712.2.

Note h. For buildings having habitable or occupiable stories or basements below grade, see Section 1006.3.1.

Note i. Not less than the rating required by this code.

Note j. For Use Group R-3, see Section 310.5.

Note k. Fireresistance ratings are expressed in hours.

Note l. In buildings which are required to comply with the provisions of Section 403.3, the required fireresistance rating for floor construction, including beams, shall be 2 hours (see Section 403.3.3.1).

Note m. 1 foot = 304.8 mm.

provided that such partitions neither establish a *corridor* serving an occupant load of more than 30 in areas occupied by a single tenant nor exceed 5,000 square feet (465 m^2) between *fire separation assemblies* or *fire walls*. The maximum allowable compartment size shall be increased to 7,500 square feet (700 m^2) where subdivided with fireretardant-treated wood that complies with Section 2310.0.

SECTION 604.0 TYPE 3 CONSTRUCTION

604.1 General: Buildings and structures of Type 3 construction are those in which the exterior walls are constructed of concrete, masonry or other approved noncombustible materials; and the interior structural elements, loadbearing walls, partitions, floors and roofs are constructed of any approved materials. Each structural element shall not have less than the required fireresistance rating specified in Table 602, except as otherwise specifically provided for in this code. Buildings of Type 3 construction shall be further classified as Type 3A or 3B.

SECTION 605.0 TYPE 4 CONSTRUCTION

605.1 General: Buildings and structures of Type 4 construction are those in which the exterior walls are constructed of approved noncombustible materials and the interior structural members are of solid or laminated wood without concealed spaces or the loadbearing walls, partitions, floors and roofs are constructed of any noncombustible materials permitted by this code. Each structure element shall have not less than the required fireresistance rating specified in Table 602. The elements of Type 4 construction shall comply with the provisions of Section 2304.0.

SECTION 606.0 TYPE 5 CONSTRUCTION

606.1 General: Buildings and structures of Type 5 construction are those in which the exterior walls, loadbearing walls, partitions, floors and roofs are constructed of any approved materials. Each structure element shall have not less than the required fireresistance rating specified in Table 602. Buildings of Type 5 construction shall be further classified as Type 5A or 5B.

CHAPTER 9

FIRE PROTECTION SYSTEMS

SECTION 901.0 GENERAL

901.1 Scope: The provisions of this chapter shall specify where *fire protection systems* are required and shall apply to the design, installation, maintenance and operation of all *fire protection systems* in all buildings and structures.

901.2 Required systems: All *fire protection systems* required by this code shall be installed, repaired, operated and maintained in accordance with this code and the fire prevention code listed in Chapter 35. All required *fire suppression* and *standpipe systems* shall be provided with at least one automatic supply of fire-extinguishing agent of adequate pressure, capacity and reliability to perform the function intended.

901.3 Nonrequired systems: Any *fire protection system* or portion thereof not required by this code shall be permitted to be furnished for partial or complete protection provided that such installed system meets applicable requirements of this code.

901.4 Maintenance: All *fire protection systems* shall be maintained in accordance with the requirements of the fire prevention code listed in Chapter 35.

901.5 Threads: All threads provided for fire department connections to *sprinkler systems*, *standpipes*, yard hydrants or any other fire hose connection shall be compatible with the connections used by the local fire department.

901.6 Signs: All signs required to identify fire protection equipment and equipment location shall be constructed of durable materials, be permanently installed and be readily visible. Letters and numbers shall contrast with the sign background and shall have an appropriate width-to-height ratio to permit the sign to be read easily.

901.7 Acceptance tests: All *fire protection systems* shall be tested in accordance with the requirements of this code and the fire prevention code listed in Chapter 35. The tests shall be conducted in the presence of the code official. All tests required by this code and the standards listed in this code shall be conducted at the expense of the owner or the owner's representative.

901.8 Certification: The contractor shall provide the code official with a certificate indicating that the system is installed in compliance with this code and the appropriate acceptance tests have been conducted.

SECTION 902.0 DEFINITIONS

902.1 General: The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

Alarm verification: A feature of automatic fire detection systems to reduce unwanted alarms wherein *automatic fire detectors* report alarm conditions for a minimum period of time, or confirm alarm conditions within a given period, after being automatically reset to be accepted as a valid alarm initiation signal (see Section 919.0).

Automatic: As applied to fire protection devices, automatic refers to a device or system that provides an emergency function without the necessity of human intervention and activated as a result of a predetermined temperature rise, rate of temperature rise or increase in the level of combustion products — such as incorporated in an *automatic sprinkler system*, automatic *fire door*, etc.

Automatic fire suppression system: An engineered system using carbon dioxide (CO_2), foam, wet or dry chemical, a halogenated extinguishing agent, a clean extinguishing agent, or an *automatic sprinkler system* to detect automatically and suppress a fire through fixed piping and nozzles (see Section 904.0).

Clean agent: Electrically nonconducting, volatile, or gaseous extinguishant that does not leave a residue upon evaporation.

Deluge system: An *automatic sprinkler system* consisting of open *sprinklers* with *water supply* valves activated by a separate automatic detection system (see Section 908.0).

Detector, heat: An alarm-initiating device that detects abnormally high temperature or rate of temperature rise (see Section 919.0).

Detector, smoke: An alarm-initiating device that detects the visible or invisible particles of combustion (see Section 919.0).

Fire alarm box, manual: A manually operated alarm-initiating device that activates a fire alarm system (see Section 918.0).

Fire alarm system: A system or portion of a combination system consisting of components and circuits arranged to monitor and annunciate the status of fire alarm or supervisory signal initiating devices and to initiate appropriate response to those signals.

Fire command station: The principal location where the status of the detection, alarm, communications and control systems is displayed, and from which the system(s) has the capability for manual control (see Sections 403.7 and 918.9).

Fire detector, automatic: An alarm-initiating device that automatically detects heat, smoke or other products of combustion (see Section 919.0).

Fire protection system: Devices, equipment and systems used to detect a fire, activate an alarm, suppress or control a fire, or any combination thereof.

Preaction system: A fire *sprinkler* system employing automatic *sprinklers* attached to a piping system containing air with a supplemental fire detection system installed in the same areas as the *sprinklers*. Actuation of the fire detection system automatically opens a valve that permits water to flow into the *sprinkler* piping system and to be discharged from any open *sprinklers* (see Section 906.9.6).

Smoke detector, multiple station: Single-station smoke detectors that are capable of being interconnected such that actuation of one causes all integral or separate audible alarms to operate (see Section 920.0).

Smoke detector, single station: An assembly incorporating the detector, the control equipment and the alarm-sounding device in one unit, which is operated from a power supply either in the unit or obtained at the point of installation (see Section 920.0).

Sprinkler: A device, connected to a *water supply* system, that discharges water in a specific pattern for extinguishment or control of fire (see Section 906.0).

Sprinkler system, automatic: A *sprinkler* system, for fire protection purposes, is an integrated system of underground or overhead piping designed in accordance with fire protection engineering standards. The system includes a suitable *water supply*. The portion of the system above the ground is a network of specially or hydraulically designed piping installed in a building, structure or area, generally overhead, and to which automatic *sprinklers* are connected in a systematic pattern. The system is usually activated by heat from a fire and discharges water over the *fire area* (see Section 906.0).

Sprinkler system, limited area: An *automatic sprinkler system* consisting of not more than 20 *sprinklers* within a *fire area* (see Section 907.0).

Standpipe system: A *standpipe* system is a *fire protection system* consisting of an arrangement of piping, valves, hose outlets and allied equipment installed in a building or structure (see Section 915.0).

Supervisory device: An initiating device used to monitor the conditions that are essential for the proper operation of *automatic fire suppression systems* (i.e., switches used to monitor the position of gate valves, a low air-pressure switch on a dry-pipe *sprinkler system*, etc.) (see Section 924.0).

Voice/alarm signaling system: A system that provides, to the occupants of a building, dedicated manual or automatic facilities, or both, for originating and distributing voice instructions, as well as alert and evacuation signals that pertain to a fire emergency (see Section 918.0).

Water supply, automatic: A water supply that is not dependent on any manual operation, such as making connections, operating valves or starting pumps (see Section 915.5).

SECTION 903.0 CONSTRUCTION DOCUMENTS

903.1 Required: *Construction documents* or shop drawings, or both, for the installation of *fire protection systems* shall be submitted to indicate conformance to this code and shall be reviewed by the department prior to issuance of the permit.

Note: Since the fire department is responsible for inspecting for the proper maintenance of *fire protection systems* in buildings, the administrative authority shall cooperate with the fire department in the discharge of responsibility to enforce this chapter.

903.2 Construction documents: The *construction documents* and shop drawings submitted to the department shall contain sufficient detail as outlined herein to evaluate the protected hazard and the effectiveness of the system.

903.2.1 Information: *Construction documents* for *fire protection systems* shall be submitted with the *construction documents* for the construction permit. Included shall be information on the contents, the occupancy, the location and arrangement of the structure and the contents involved, the exposure to any hazard, the extent of the system coverage, the suppression system design criteria, the supply and extinguishing agents, the location of any *standpipes*, and the location and method of operation of detection and alarm devices.

903.2.2 Shop drawings: Shop drawings for the installation of *fire protection systems* shall be submitted for review and approval prior to the installation of a *fire protection system*. Included on the shop drawings shall be information showing the basis for compliance with the design density, the specific arrangement of the system, the devices and their method(s) of operation, and the suppression agent. The details on the *construction documents* or shop drawings for the *fire protection system* shall include design considerations, spacing and arrangement of fire protection devices, protection agent supply and discharge requirements, calculations with sizes and equivalent lengths of pipe and fittings, and protection agent source. Sufficient information shall be included to identify the apparatus and devices utilized and other information as required by this code.

SECTION 904.0 FIRE SUPPRESSION SYSTEMS

904.1 Where required: *Automatic fire suppression systems* shall be installed where required by this code, and in the locations indicated in Sections 904.2 through 904.12.

Exceptions

1. An *automatic fire suppression system* shall not be required in portions of buildings that comply with Section 406.0 for open parking structures.
2. In telecommunications equipment buildings, an *automatic fire suppression system* shall not be required in those spaces or areas occupied exclusively for telecommunications equipment, associated electrical power

distribution equipment, batteries and standby engines, provided that those spaces or areas are equipped throughout with an automatic fire detection system in accordance with Section 919.0 and are separated from the remainder of the building with *fire separation assemblies* consisting of 1-hour fireresistance rated walls and 2-hour fireresistance rated floor/ceiling assemblies.

904.2 Use Groups A-1, A-3 and A-4: Where a Use Group A-1, A-3 or A-4 *fire area* exceeds 12,000 square feet (1116 m²) in area, an *automatic fire suppression system* shall be provided as follows:

1. Throughout the entire story or floor level where the A-1, A-3 or A-4 use group is located;
2. Throughout all stories and floor levels below the A-1, A-3 or A-4 use group; and
3. Throughout all intervening stories and floor levels between the A-1, A-3 or A-4 use group and the highest *level of exit discharge* that serves Use Group A-1, A-3 or A-4 *fire areas*, including the highest *level of exit discharge*.

Exceptions

1. Auditorium areas of Use Group A-1 or A-3 where the main auditorium floor is at the *level of exit discharge* of the main entrance.
2. Naves and chancels of Use Group A-4 where the main floor of the nave or chancel is at the *level of exit discharge* of the main entrance.
3. Participant sport areas of Use Group A-3 where the main floor of the participant sport area is at the *level of exit discharge* of the main entrance.

904.3 Use Group A-2: Where a Use Group A-2 *fire area* is more than 5,000 square feet (465 m²) in area or is located either above or below the *level of exit discharge* of *exits* that serve the Use Group A-2 *fire area*, an *automatic fire suppression system* shall be provided as follows:

1. Throughout the entire story or floor level where the A-2 Use Group is located;
2. Throughout all stories and floor levels below the A-2 Use Group; and
3. Throughout all intervening stories and floor levels between the A-2 Use Group and the *level of exit discharge* of *exits* that serve the Use Group A-2 *fire area*, including the *level of exit discharge*.

904.4 Use Group E: An *automatic fire suppression system* shall be provided throughout all buildings having a Use Group E *fire area* which exceeds 20,000 square feet (1860 m²) in area.

904.5 Use Group H: An *automatic fire suppression system* shall be provided throughout all Use Group H *fire areas*. An *automatic fire suppression system* shall not be required for magazines used for the storage of Use Group H-1 materials and which are constructed and located in accordance with NFPA 495 and the fire prevention code listed in Chapter 35.

Exceptions

1. An *automatic fire suppression system* shall not be required for magazines used for the storage of Use Group H-1 materials which are constructed and located in accordance with NFPA 495 and the fire prevention code listed in Chapter 35.
2. An *automatic fire suppression system* shall not be required for grain storage tanks, silos and bins.

904.6 Use Group I: An *automatic fire suppression system* shall be provided throughout all buildings with a Use Group I *fire area*.

Exception: An *automatic fire suppression system* shall not be required for Use Group I-2 care facilities as defined in Section 308.3.1 located at the level of exit discharge, which accommodate 100 occupants or less and in which each care room has an exit door directly to the exterior.

904.7 Use Groups M, S-1 and F-1: Throughout all buildings with a Use Group M, S-1 or F-1 *fire area*, an *automatic fire suppression system* shall be provided as follows:

1. Where any Use Group M, S-1 or F-1 *fire area* exceeds 12,000 square feet (1116 m²) in area;
2. Where the total combined area of all Use Group M, S-1 and F-1 *fire areas* on all floors exceeds 24,000 square feet (2232 m²); or
3. Where any Use Group M, S-1 or F-1 *fire area* is more than three *stories above grade*.

Exception: *Public garages* shall conform to Section 408.0.

904.8 Use Group R-1: An *automatic fire suppression system* shall be provided throughout all buildings with a Use Group R-1 *fire area* in accordance with Section 906.2.1 or 906.2.2.

Exception: Where all guestrooms are not more than three stories above the lowest *level of exit discharge* of the *exits* serving the guestrooms. Each guestroom shall have at least one door opening directly to an exterior *exit access* which leads directly to the *exits*.

904.9 Use Group R-2: An *automatic fire suppression system* shall be provided throughout all buildings with an occupancy in Use Group R-2, other than residential care facilities, in accordance with Section 906.2.1 or 906.2.2.

Exception: Buildings which do not exceed two stories, including *basements* which are not considered as a *story above grade*, and with a maximum of 12 *dwelling units* per *fire area*. Each *dwelling unit* shall have at least one door opening to an exterior *exit access* that leads directly to the *exits* required to serve that *dwelling unit*.

904.10 Use Group R-2 or R-3 residential care facilities: An automatic sprinkler system shall be provided throughout all buildings with a Use Group R-2 or R-3 residential care facility *fire area* in accordance with Section 906.2.1 or 906.2.2. The building shall be equipped with sprinkler systems in accordance with NFPA 13R listed in Chapter 35 or approved quick-response sprinklers in accordance with NFPA 13 listed in Chapter 35. An automatic sprinkler system is not required for residential care facilities of Occupancy Condition 1 where every floor level, including basements, is provided with an exit door directly to the exterior.

904.11 Windowless story: An *automatic fire suppression system* shall be provided throughout every story or *basement* of all buildings where there is not provided at least one of the following types of openings:

1. An exterior *stairway* that conforms to the requirements of Section 1014.0, or an outside ramp that conforms to the

requirements of Section 1016.0, leading directly to grade in each 50 linear feet (15240 mm) or fraction thereof of exterior wall in the story or *basement*, on at least one side of the building.

2. Openings entirely above the adjoining ground level totaling 20 square feet (1.9 m^2) in each 50 linear feet (15240 mm) or fraction thereof of exterior wall in the story or *basement*, on at least one side of the building. Openings shall have a least dimension of not less than 22 inches (559 mm), and shall have a minimum net clear opening of 5 square feet (0.5 m^2). Access to such openings from the exterior shall be provided to the fire department and such openings shall be unobstructed to allow fire-fighting and rescue operations from the exterior.

Where openings in a story are provided on only one side and the opposite wall of such story is more than 75 feet (22860 mm) from such openings, the story shall be equipped throughout with an *automatic sprinkler system* or openings as specified herein shall be provided on at least two sides of the exterior walls of the story. If any portion of a *basement* is located more than 75 feet (22860 mm) from the openings required in this section, the *basement* shall be equipped throughout with an *automatic sprinkler system.*

Exception: Occupancies in Use Group R-3.

904.12 Other required suppression systems: In addition to the requirements of this section, the sections of this code indicated in Table 904.12 also require the installation of an *automatic fire suppression system* for certain buildings and areas.

Table 904.12
ADDITIONAL REQUIRED SUPPRESSION SYSTEMS

Section	Subject
302.1.1	Specific occupancy areas
402.10	Covered mall buildings
403.2	High-rise buildings
404.2	Atriums
405.3	Underground structures
408.3.1	Public garages
408.4	Fuel-dispensing areas
411.7	Sound stages
412.6	Stages and enclosed platforms
413.4	Special amusement buildings
416.4	HPM facilities
417.6.6	Hazardous material dispensing/utilization areas, outside
419.3	Paint spray booths and storage rooms
507.1	Unlimited area buildings
1013.2.2	Smoke-protected assembly seating areas
1020.3	Exit lobbies
2806.4	Drying rooms
2807.6	Waste and linen chutes and termination and incinerator rooms
2808.4	Refuse vaults

SECTION 905.0 SUPPRESSION SYSTEM AGENT COMPATIBILITY

905.1 Agent compatibility: The extinguishing agent for each *suppression system* shall be compatible with the type of hazard and fire. Each fixed *fire suppression system* shall be of an approved type and shall be designed and installed in accordance with the requirements of this code.

905.1.1 Special hazards: In rooms or buildings containing combustibles (such as aluminum powder, calcium carbide, calcium phosphide, metallic sodium and potassium, quicklime, magnesium powder or sodium peroxide) that are incompatible with water as an extinguishing agent, other extinguishing agents shall be utilized.

SECTION 906.0 FIRE SPRINKLER SYSTEM

906.1 General: *Automatic sprinkler systems* shall be approved and shall be designed and installed in accordance with the provisions of this code.

906.2 Equipped throughout: Where the provisions of this code require that a building or portion thereof be equipped throughout with an *automatic sprinkler system*, the system shall be designed and installed in accordance with Section 906.2.1, 906.2.2 or 906.2.3.

Exception: Where water as an extinguishing agent is not compatible with the fire hazard (see Section 905.1) or is prohibited by a law, statute or ordinance, the affected area shall be equipped with an approved *automatic fire suppression system* utilizing a suppression agent that is compatible with the fire hazard.

906.2.1 NFPA 13 systems: The system shall be designed and installed in accordance with NFPA 13 listed in Chapter 35.

Exceptions

1. In Use Group R *fire areas*, other than Use Group R residential care facilities, *sprinklers* shall not be required in bathrooms that do not exceed 55 square feet (5.12 m^2) in area and are located within individual *dwelling units* or guestrooms.
2. In occupancies in Use Group R-1, *sprinklers* shall not be required in guestroom closets that do not exceed 24 square feet (2.23 m^2) in area.

906.2.2 NFPA 13R systems: In buildings four stories or less in *height*, systems designed and installed in accordance with NFPA 13R listed in Chapter 35 shall be permitted in Use Group R *fire areas. Sprinklers* shall not be required in bathrooms, other than Use Group R residential care facilities, that do not exceed 55 square feet (5.12 m^2) in area and are located within individual *dwelling units* or guestrooms.

906.2.3 NFPA 13D systems: In Use Group R-3 *fire areas* with at least 1-hour fireresistance rated *fire separation assemblies* between *dwelling units*, systems designed and installed in accordance with NFPA 13D listed in Chapter 35 shall be permitted.

Exceptions

1. *Sprinklers* shall not be required in bathrooms that do not exceed 55 square feet (5.12 m^2) in area.
2. A single fire protection *water supply* shall be permitted to serve not more than eight *dwelling units* provided that the *water supply* is increased by 5 gallons per minute (gpm) (18.9 L/min) for each *dwelling unit* served where a common supply serves both the domestic and *sprinkler systems* in more than one *dwelling unit.*

906.3 Design: The details of the system indicated on the *construction documents* shall include calculations and information

on the *sprinkler* spacing and arrangement, *water supply* and discharge requirements, size and equivalent lengths of pipe and fittings and *water supply* source. Sufficient information shall be included to identify the apparatus and devices used.

906.4 Actuation: Water *sprinkler systems* shall be automatically actuated unless otherwise specifically provided for in this code.

906.5 Sprinkler alarms: Approved audible or visual alarm devices shall be connected to every water *sprinkler system*. Such alarm devices shall be activated by water flow and shall be located in an approved location on the exterior of the building and an additional audible or visual alarm device shall be installed within the building.

Exceptions

1. Alarms and alarm attachments shall not be required for *limited area sprinkler systems* (see Section 907.5).
2. Audible or visual alarm devices shall not be required on the exterior of the building for fire *sprinkler systems* supervised by method 1 of Section 924.1.

906.6 Water-control valve identification: All valves controlling water to *fire protection systems* shall be provided with permanently attached identification tags indicating the valves' function and what is controlled.

906.7 Sprinkler riser: A *sprinkler system* riser which also serves as the wet *standpipe* riser in buildings required to have or having both systems shall conform to Section 915.6.

906.8 Signs: Where *sprinkler* control valves are located in a separate room or building, a sign shall be provided on the entrance door. The lettering for such sign shall conform to Section 901.6, shall be at least 4 inches (102 mm) in height and shall read "Sprinkler Control Valves."

906.9 Acceptance tests: All *sprinkler systems* shall be tested in accordance with Sections 906.9.1 through 906.9.6.

906.9.1 Underground connections: Lead-in connections shall be flushed and tested in accordance with NFPA 13 and 24 listed in Chapter 35.

906.9.2 Hydrostatic test: All *sprinkler systems* shall be tested hydrostatically for 2 hours without visible leakage at not less than 200 psi (1379 kPa) or at 50 psi (344.75 kPa) in excess of the maximum static pressure, whichever is greater. The test pressure shall be read from a gauge located at the low elevation point of the individual system or portion of the system being tested.

Exception: When climatic conditions will not permit testing with water, an interim test shall be conducted with air pressure in accordance with Section 906.9.3 and the standard hydrostatic test shall be conducted when weather conditions permit.

906.9.3 Air test: Before the *water supply* for a dry pipe system is turned on and the system is placed into service, the system shall be tested with air pressure of at least 40 psi (276 kPa) and be allowed to stand 24 hours with a maximum pressure loss of $1^1/_2$ psi (10.34 kPa). To prevent damaging the valve, the clapper valve of a differential-type dry pipe valve shall be held off the valve seat during any test at a pressure in excess of 50 psi (344.75 kPa). Automatic air-pressure maintenance devices shall be capable of restoring normal operating air pressure in the system within 30 minutes except for low-differential dry pipe systems where the maximum recovery time shall be 60 minutes.

906.9.4 Main drain test: A drain test shall be performed in order to obtain both static and residual pressure readings.

906.9.5 Flow test: All systems shall be tested at the test pipe to determine that water-flow detecting devices, including the associated alarm circuits, are in proper working order. Dry pipe systems shall deliver water to the inspector's test pipe in not more than 60 seconds.

906.9.6 Preaction and deluge systems: Testing of the supplemental fire detection system designed to activate *preaction* and *deluge systems* shall be in accordance with Section 918.10.

SECTION 907.0 LIMITED AREA SPRINKLER SYSTEMS

907.1 General: A *limited area sprinkler system* shall be of an approved type and shall be installed in accordance with the provisions of this section.

907.2 Where permitted: Where the provisions of this code require the installation of a *fire suppression system*, and a water *sprinkler* extinguishing system is used with a limited number of *sprinklers*, a *limited area sprinkler system* that complies with the requirements of this section is permitted to be installed.

907.2.1 Within a fire area: A *limited area sprinkler system* shall be permitted within one *fire area* provided that 20 *sprinklers* or less are required based on the spacing limitations of NFPA 13 listed in Chapter 35.

907.2.2 Special occupancy areas: A *limited area sprinkler system* shall be permitted within special occupancy areas as designated in Chapter 4 or within specific occupancy areas as designated in Section 302.1.1, provided that the area is enclosed within *fire separation assemblies* as required by this code, and 20 *sprinklers* or less are required to protect each separately enclosed area. Where nonfireresistance rated separation walls are permitted by Table 302.1.1 to enclose contiguous specific occupancy areas on one floor, the areas shall be considered to be one separately enclosed area for the purposes of determining the number of *sprinklers*.

907.2.3 Unenclosed floor openings, waste and linen chutes, and kitchen and hazardous exhaust systems: A *limited area sprinkler system* shall be permitted to protect unenclosed *escalator* floor openings that comply with Section 3011.2.2, chutes used for waste or linen collection, commercial kitchen exhaust systems and duct systems that exhaust *hazardous materials*.

907.3 Design: Except as otherwise provided for in this section, a *limited area sprinkler system* shall be designed and installed in accordance with Section 906.0.

907.4 Actuation: A *limited area sprinkler system* shall be automatically actuated.

907.5 Sprinkler alarms: Alarms and alarm attachments shall not be required.

907.6 Standpipe connection: The *water supply* for the *limited area sprinkler system* shall be from the building *standpipe system* where the building is equipped with a *standpipe system* that is sized for a 500-gallon-per-minute (1890 L/min) minimum flow and has an *automatic water supply* (see Section 915.5).

907.6.1 Domestic supply: Where *limited area sprinkler systems* are supplied from the domestic water system, the domestic water system shall be designed to support adequately the design flow of the largest number of *sprinklers* required to be hydraulically calculated by NFPA 13 listed in Chapter 35 in any one of the enclosed areas plus the domestic demand.

907.6.2 Cross connection: The potable water supply shall be protected against backflow in accordance with the requirements of Section 2905.4.2 and the plumbing code listed in Chapter 35.

907.6.3 Domestic connection: Shutoff valves shall not be permitted in the *suppression system* piping. *Water supply* shall be controlled by the riser control valve to the domestic water piping.

Exceptions

1. Shutoff valves in the *sprinkler system* piping are permitted, provided that such valves are supervised in accordance with Section 924.0.
2. Backflow preventer test valves, which are of the indicating type, located in the *sprinkler system* piping, shall be locked in the open position. In occupancies required to be equipped with a fire alarm system, the valve shall be supervised as required for the fire alarm system on a separate zone in accordance with Section 924.2.

907.7 Acceptance tests: All *limited area sprinkler systems* which are not connected to a building *standpipe system* shall be tested hydrostatically for a minimum of 15 minutes without visible leakage at the working pressure under which the system is to be used. *Limited area sprinkler systems* which are connected to a building *standpipe system* shall be tested in accordance with Section 915.12.2.

SECTION 908.0 WATER-SPRAY FIXED SYSTEMS

908.1 General: Water-spray fixed systems for fire suppression shall be of an approved type and shall be installed in accordance with the provisions of this code and NFPA 15 listed in Chapter 35. A water-spray fixed system is a system connected to a reliable source of *water supply* and equipped with normally open water-spray nozzles for specific discharge and distribution over the surface or area to be protected.

908.2 Design: Complete *construction documents* and hydraulic calculations shall be submitted for review prior to installation. The submittal shall include nozzle layouts, friction loss, calculations, *water supply* data and a detailed layout of the entire area to be protected.

908.3 Actuation: Water-spray systems shall be automatically actuated and shall be provided with a manual means of actuation.

908.4 Acceptance tests: All new system piping shall be flushed and tested in accordance with the provisions of NFPA 15 listed in Chapter 35.

SECTION 909.0 CARBON DIOXIDE EXTINGUISHING SYSTEMS

909.1 General: Carbon dioxide extinguishing systems shall be of an approved type and shall be installed in accordance with the provisions of this code and NFPA 12 listed in Chapter 35. A carbon dioxide extinguishing system is a system which supplies CO_2 from a pressurized vessel through fixed pipes and nozzles.

909.2 Design: The details of the system indicated on the *construction documents* shall include information and calculations of the amount of carbon dioxide; the location and flow rate of each nozzle including equivalent orifice area; and the location and size of the carbon dioxide storage facility. Information shall be submitted pertaining to the location and function of *detecting devices*, operating devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features shall be adequately explained.

909.3 Actuation: Carbon dioxide extinguishing systems shall be automatically actuated and shall be provided with a manual means of actuation.

909.4 Safety requirements: Where persons will enter or be trapped in atmospheres made hazardous by carbon dioxide discharge, warning signs and discharge alarms shall be provided.

909.5 Acceptance tests: All carbon dioxide extinguishing systems shall be tested in accordance with NFPA 12 listed in Chapter 35. A completed system shall be tested for tightness up to the selector valve, and for continuity of piping with free unobstructed flow beyond the selector valve. The identification of devices with proper designations and instructions shall be checked. Operational tests shall be conducted on all devices except cylinder valves in multicylinder high-pressure systems. Where conditions prevail that make it difficult to determine adequately the system requirements or design, a suitable discharge test and concentration analysis shall be made.

SECTION 910.0 DRY-CHEMICAL EXTINGUISHING SYSTEMS

910.1 General: Dry-chemical extinguishing systems shall be of an approved type and shall be installed in accordance with the provisions of this code and NFPA 17 listed in Chapter 35. A dry-chemical extinguishing system is a system consisting of dry chemical and expellant gas storage tanks, fixed piping and nozzles used to assure proper distribution of an approved extinguishing agent to a specific fire hazard or into a potential fire area.

910.2 Design: The details of the system indicated on the *construction documents* shall include sufficient information and calculations of the amount of dry chemical; the size, length and arrangement of connected piping, or piping and hose; and a description and location of nozzles so that the adequacy of the system can be determined. Information shall be submitted pertaining to the location and function of *detecting devices*, operating devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features shall be adequately explained.

910.3 Actuation: Dry-chemical extinguishing systems shall be automatically actuated and shall be provided with a manual means of actuation.

910.4 Safety requirements: Where persons will be exposed to a dry-chemical discharge, warning signs and discharge alarms shall be provided.

910.5 Acceptance tests: All dry-chemical extinguishing systems shall be tested in accordance with NFPA 17 listed in Chapter 35. A completed system shall be tested by a discharge of expellant gas through the piping and nozzles. Observations for gas leakage and for continuity of piping with free unobstructed flow shall be made. Observations shall be made of the flow of expellant gas through all nozzles. The identification of devices with proper designations and instructions shall be checked. After testing, all piping and nozzles shall be blown clean using compressed air or nitrogen, and the system shall be properly charged and placed in the normal "set" condition.

910.5.1 Discharge test: All systems shall be tested by a discharge of expellant gas through the piping and nozzles with observations being made of the flow of expellant gas through all nozzles as well as observing for leakage and continuity of piping with free unobstructed flow.

910.6 Range hoods: In addition to the requirements of this section and the mechanical code listed in Chapter 35, range hood dry-chemical systems shall bear the *label* of an *approved agency*. The system shall be installed in accordance with the manufacturer's installation instructions. The dry-chemical agent of the system shall be nontoxic.

SECTION 911.0 FOAM-EXTINGUISHING SYSTEMS

911.1 General: Foam-extinguishing systems shall be of an approved type and shall be installed in accordance with the provisions of this code and NFPA 11, 11A and 16 listed in Chapter 35. A foam-extinguishing system is a special system designed to discharge, either mechanically or chemically, a foam made from concentrates, over the area to be protected.

911.2 Design: The details of the system indicated on the *construction documents* shall include complete computations showing pressure drop in all system piping, friction loss calculations of liquid lines and a detailed layout of the entire hazard area to be protected. Hydraulic characteristics of foam proportioners and foam makers as determined by tests shall be supplied by the manufacturer to the department (including the range of operating conditions required for the proposed installation) to permit determination of the adequacy of the hydraulics of the proposed protection.

911.3 Actuation: A foam-extinguishing system shall be automatically actuated and shall be provided with a manual means of actuation.

911.4 Safety requirements: In any proposed use of a medium- or high-expansion foam where persons will be exposed to the foam discharge, warning signs and discharge alarms shall be provided.

911.5 Acceptance tests: All foam-extinguishing systems shall be tested in accordance with NFPA 11, 11A and 16 listed in Chapter 35. The system shall be subjected to a flow test to ensure that the hazard area is fully protected in compliance with the design specifications, and to determine flow pressures, actual discharge capacity, foam quality, consumption rate of foam-producing materials, manpower requirements and other operating characteristics.

SECTION 912.0 HALOGENATED EXTINGUISHING SYSTEMS

912.1 General: Halogenated extinguishing systems shall be of an approved type and shall be installed in accordance with the provisions of this code and NFPA 12A listed in Chapter 35. A halogenated extinguishing system is a system consisting of pipes, open nozzles and a container of halogenated agent under pressure.

912.2 Design: The details of the system indicated on the *construction documents* shall include information and calculations of the amount of extinguishing agent; the container storage pressure; the location and flow rate of each nozzle including equivalent orifice area; the location, size and equivalent lengths of pipe, fittings and hose; and the location and size of the storage facility. Information shall be submitted pertaining to the location and function of *detecting devices*, operating devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features shall be adequately explained.

912.3 Actuation: Halogenated extinguishing systems shall be automatically actuated and shall also be provided with a manual means of actuation.

912.4 Safety requirements: Where persons will enter or be trapped in atmospheres made hazardous by a halogenated system discharge, warning signs and discharge alarms shall be provided.

912.5 Acceptance tests: All halogenated extinguishing systems shall be tested in accordance with NFPA 12A listed in Chapter 35. A completed system shall be tested for tightness up to the selector valve, and for continuity of piping with free unobstructed flow beyond the selector valve. The identification of devices with proper designations and instructions shall be checked. Operational tests shall be conducted on all devices except cylinder valves in multicylinder systems. Where conditions prevail that make it difficult to determine adequately the system requirements or design, a suitable discharge test and concentration analysis shall be made.

SECTION 913.0 CLEAN AGENT FIRE EXTINGUISHING SYSTEMS

913.1 General: Clean agent fire extinguishing systems shall be of an approved type and shall be designed and installed in accordance with the provisions of this section and the manufacturer's instructions. A clean agent fire extinguishing system is a system consisting of pipes, open nozzles and a container of an approved clean agent under pressure.

913.2 Design: The details of the system indicated on the construction documents shall include information and calculations of the amount of extinguishing agent; the container storage pressure; the location and flow rate of each nozzle including equivalent orifice area; and the location and size of the storage facility. Information shall be submitted pertaining to the location and function of the detecting devices, operating devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features shall be explained.

913.3 Actuation: Clean agent fire extinguishing systems shall be automatically actuated and provided with a manual means of actuation.

913.4 Safety requirements: Where persons will enter or be trapped in atmospheres made hazardous by a clean agent system discharge, warning signs and discharge alarms shall be provided.

913.5 Acceptance tests: All completed clean agent fire extinguishing systems shall be tested for tightness up to the selector valve, and for continuity of piping with free unobstructed flow beyond the selector valve. The labeling of devices with proper designations and instructions shall be checked. Operational tests shall be conducted on all devices except cylinder valves in multicylinder systems. Where conditions prevail that make it difficult to determine adequately the system requirements or design, a suitable discharge test and concentration analysis shall be made.

SECTION 914.0 WET-CHEMICAL RANGE HOOD EXTINGUISHING SYSTEMS

914.1 General: Wet-chemical extinguishing systems shall be installed in accordance with the provisions of this section, and the mechanical code and NFPA 17A listed in Chapter 35. The system shall bear the *label* of an *approved agency* and shall be installed in accordance with the manufacturer's installation instructions. A wet-chemical system is a solution of water and approved chemicals from a concentrate which forms the extinguishing agent.

914.2 Design: The details of the system indicated on the *construction documents* shall include sufficient information and calculations on the amount of wet chemical; the size, length and arrangement of connected piping; and a description and location of nozzles so that the adequacy of the system can be determined. Information shall be submitted pertaining to the location and function of *detecting devices*, operating devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features shall be adequately explained.

914.3 Actuation: Wet-chemical extinguishing systems shall be automatically actuated and shall be provided with a manual means of actuation.

914.4 Safety requirements: Where persons will be exposed to a wet-chemical discharge, warning signs and discharge alarms shall be provided.

914.5 Acceptance tests: All wet-chemical extinguishing systems shall be tested in accordance with NFPA 17A listed in Chapter 35. A completed system shall be tested by discharge of wet chemical in sufficient amounts to verify that the system is properly installed and functional. Tests shall include a check of the detection systems, the alarms and the releasing devices, including manual stations, fuel and power shutoff devices and other associated equipment.

914.5.1 Discharge test: All systems shall be tested by a discharge of expellant gas through the piping and nozzles with observations being made of the flow of expellant gas through all nozzles as well as observing for leakage and continuity of piping with free unobstructed flow.

SECTION 915.0 STANDPIPE SYSTEMS

915.1 General: *Standpipe systems* shall be installed and maintained in accordance with the provisions of this code, and the fire prevention code and NFPA 14 listed in Chapter 35.

915.2 Where required: *Standpipe systems* shall be installed where required by this code and in the locations indicated in Sections 915.2.1 through 915.2.4.

Exception: Occupancies in Use Group R-3.

915.2.1 Building height: *Standpipe systems* shall be installed throughout all buildings in which the floor level of the highest story is located more than 30 feet (9144 mm) above the lowest level of the fire department vehicle access or in which the floor level of the lowest story is located more than 30 feet (9144 mm) below the highest level of fire department vehicle access.

915.2.2 Building area: *Standpipe systems* shall be installed in all buildings where any portion of the building floor *area* is more than 400 feet (122 m) of travel from the nearest point of fire department vehicle access.

Exceptions

1. Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1 or 906.2.2.
2. Occupancies in Use Group A-4, A-5, F-2, R-2, S-2 or U.
3. Buildings less than 10,000 square feet (930 m^2).

915.2.3 Malls: *Standpipe systems* shall be installed in all malls in accordance with Section 402.11.

915.2.4 Stages: *Standpipe systems* shall be installed in *stages* in accordance with Section 412.7.

915.3 Types of systems: A *standpipe system* shall be one of the following types:

1. A wet *standpipe system* having the supply valve open and water pressure maintained at all times;
2. A dry *standpipe system* so arranged through the use of approved devices as to admit water to the system automatically by opening a hose valve;
3. A dry *standpipe system* arranged to admit water to the system through manual operation of approved remote control devices located at each hose connection; or
4. A dry *standpipe system* that does not have a permanent *water supply*.

915.3.1 Type of system required: Buildings required by Section 915.2 to be equipped with *standpipe systems* shall be provided with a wet *standpipe system* that complies with Section 915.3, item 1.

Exceptions

1. Buildings in which the highest floor is located not more than 75 feet (22860 mm) above the lowest level of fire department vehicle access shall be permitted to use a *standpipe system* that complies with Section 915.3, item 2 or 3.
2. Buildings which are equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1 and in which the highest floor is located not more than 150 feet (45720 mm) above the lowest

level of fire department vehicle access, shall be permitted to use a *standpipe system* complying with Section 915.3, item 2 or 3.

3. Open parking structures in which the highest floor is located not more than 150 feet (45720 mm) above the lowest level of fire department vehicle access shall be permitted to use a *standpipe system* complying with Section 915.3, item 2, 3 or 4.

915.4 Piping design: The riser piping, supply piping and the water service piping shall be sized to maintain a residual pressure of at least 65 psi (448 kPa) at the topmost outlet of each riser while flowing the minimum quantities of water specified in Sections 915.4.1 and 915.4.2. The pipe size shall be based on the capacity of the *automatic water supply* system or, where an *automatic water supply* is neither required nor provided to maintain the residual pressure of 65 psi (448 kPa), the pipe size shall be based on a pressure of 150 psi (1034 kPa) available at the fire department connection.

Exception: The residual pressure of 65 psi (448 kPa) is not required in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1 and where the highest floor level is not more than 150 feet (45720 mm) above the lowest level of fire department vehicle access.

915.4.1 Riser sizing: The riser size shall be based on hydraulic calculations for a minimum flow of 500 gallons per minute (gpm) (1892 L/min.).

Exceptions

1. Where only $1^1/_2$-inch valves are provided, the riser(s) shall be sized to provide a minimum flow of 100 gpm (378 L/min.).
2. In buildings where *limited area sprinkler systems* are supplied with water from a common *standpipe* riser, the riser shall be sized to satisfy total demand.
3. For occupancies in Use Group B, I, R-1 or R-2 in buildings that are equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1, each riser shall be sized for a minimum flow of 250 gpm (945 L/min.).
4. Risers that are sized in accordance with the pipe schedule requirements of NFPA 14 listed in Chapter 35 are not subject to this requirement.

915.4.2 System pipe sizing: The system piping, including the horizontal or common feeder lines, shall be sized for a minimum flow of 500 gpm (1892 L/min.). Where more than one *standpipe* riser is required or provided, all common system piping shall be sized for a minimum flow of 500 gpm (1892 L/min.) for the first riser plus 250 gpm (945 L/min.) for each additional riser, and the total shall not be required to exceed 1,250 gpm (4731 L/min.).

Exceptions

1. Where only $1^1/_2$-inch valves are provided, the supply piping shall be sized for a minimum flow of 100 gpm (378 L/min.) for each riser, and the total shall not be required to exceed 500 gpm (1892 L/min.).
2. In buildings where *limited area sprinkler systems* are supplied with water from a common *standpipe* riser, the supply piping shall be sized for a minimum flow of 500 gpm (1892 L/min.) plus the *sprinkler* demand for the first riser, plus 250 gpm (945 L/min.) for each additional riser, and the total shall not be required to exceed 1,250 gpm (4731 L/min.).
3. For occupancies in Use Group B, I, R-1 or R-2 in buildings that are equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1, all common supply piping shall be sized for a minimum flow of 250 gpm (945 L/min.) for the first riser plus 250 gpm (945 L/min.) for each additional riser, and the total shall not be required to exceed 750 gpm (2838 L/min.).

915.5 Water supply: A *water supply* for fire department equipment shall be available to the building site. The *water supply* shall be capable of a minimum flow as required by Section 915.4.2 for a duration of 30 minutes.

915.5.1 Automatic water supply: An *automatic water supply* is required for all *standpipe systems*. The *automatic water supply* and supply piping shall be capable of delivering a flow of 500 gpm (1892 L/min.) at the residual pressure specified in Section 915.4 for a duration of 30 minutes.

Exceptions

1. In buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 906.2.1 where the highest floor is located not more than 150 feet (45720 mm) above the lowest level of fire department vehicle access, the *automatic water supply* is not required to exceed the requirements of NFPA 13 listed in Chapter 35.
2. Dry *standpipe systems* installed in open parking structures.

915.5.2 Interconnection: The required *water supply* shall be connected to the base of each *standpipe* riser. Where more than one *standpipe* riser is required, all risers shall be interconnected with a common supply line. An approved indicating valve shall be installed to permit individual risers to be taken out of service.

915.6 Control valves: Where a *standpipe system* riser also serves as the *automatic sprinkler system* riser in buildings required to have both systems or in buildings having both systems, *sprinkler* control valves shall be installed at each floor level at the connection to the riser.

915.7 Hose connection: A *standpipe* hose connection shall be located at each floor level at every *exit stairway*, and on each side of the wall adjacent to the *exit* opening of a *horizontal exit*.

Exceptions

1. Where floor areas adjacent to a *horizontal exit* are reachable from *exit stairway* outlets by a 30-foot (9144 mm) hose stream from a nozzle attached to 100 feet (30480 mm) of hose, a hose connection shall not be required at the *horizontal exit*.
2. *Standpipe* hose connections for systems required by Section 915.2.2 shall be permitted to be located only at *exits* such that all portions of the building floor area are not more than 200 feet (60960 mm) from a hose connection or 400 feet (122 m) from the nearest point of fire department vehicle access.

915.7.1 Location: At each floor level, and not more than 5 feet (1524 mm) above the floor, there shall be connected to each *standpipe* a $2^1/_2$-inch hose connection with valves and threads compatible with the connections used by the local fire department.

915.7.2 Roof hydrants: Where *standpipes* are installed in buildings more than six stories or 75 feet (22860 mm) in *height*, at least one riser shall extend through the roof and terminate in a two-way, $2^1/_2$-inch hose connection. The main control valve on a roof hydrant or manifolded hose connection shall be located in an area that is not subject to freezing, is as close to the roof access as practical and is plainly identified (see Section 916.8).

915.7.3 Pressure-regulating devices: Where residual pressures at any *standpipe* hose outlet exceed 100 psi (690 kPa), approved pressure-regulating devices shall be installed at the outlets to limit the pressure to 100 psi (690 kPa). Such devices shall regulate pressure under flow and no-flow conditions and shall not be capable of being adjusted to pressures higher than 100 psi (690 kPa) unless approved. The pressure on the inlet side of the pressure-regulating device shall not exceed the rated working pressure of the device.

Exception: Pressure-reducing devices are not required where fire hoses are not provided and pressures (static or residual) do not exceed 175 psi (1207 kPa).

915.7.4 Protection of risers: Risers and laterals of *standpipe systems* of the types complying with Section 915.3, item 2 or 3, and not located within a fireresistance rated *exit* enclosure, shall be enclosed by construction having a minimum fire-resistance rating equal to that required for *shaft* enclosures in the building.

Exception: Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1 or 906.2.2.

915.8 Test gauges: An approved water pressure gauge shall be attached to each discharge pipe from fire pump and public supply, at the pressure tank, at the air pump that supplies pressure to the tank and at the top of each *standpipe* riser for inspection and test purposes. Shutoff valves, with provisions for bleeding pressure from the gauge, shall be installed between the gauge and the top of the riser. Access to the gauges shall be provided and the gauges shall be located in spaces not subject to freezing.

Exception: Where more than one *standpipe* riser is interconnected at the top, a single gauge properly located is permitted to be substituted for the gauge at the top of each *standpipe* riser.

915.9 Materials: All *standpipes* shall be constructed of approved materials. All pipe, fittings and valves shall be of an extra-heavy pattern where the normal working pressure will exceed 175 psi (1207 kPa).

915.10 Unheated areas: Portions of the *standpipe system* which contain water shall be protected from freezing.

915.11 Signs: Where control valves are located in a separate room or building, a sign shall be provided on the entrance door. The lettering of such sign shall conform to Section 901.6 and shall be at least 4 inches (102 mm) in height and shall read "Standpipe Control Valves."

915.12 Acceptance tests: All *standpipe systems* shall be tested in accordance with Sections 915.12.1 through 915.12.4.

915.12.1 Underground connections: Underground mains and lead-in connections shall be flushed and tested in accordance with NFPA 14 and 24 listed in Chapter 35.

915.12.2 Hydrostatic test: All systems shall be tested hydrostatically for 2 hours at not less than 200 psi (1379 kPa) or at 50 psi (345 kPa) in excess of the maximum static pressure, whichever is greater. The hydrostatic pressure shall be measured at the low elevation point of the individual system or zone being tested. The inside *standpipe* piping shall not show any leakage.

915.12.3 Flow test: All systems shall have a flow test conducted at the hydraulically most-remote outlet to determine compliance with the single-riser criteria of Section 915.4.

915.12.4 Dry devices: A working test of valves, quick-opening devices and air maintenance devices installed in systems complying with Sections 915.3, item 2 or 3, shall be made before acceptance. These systems shall deliver water at the most remote hose outlet in not more than 60 seconds.

SECTION 916.0 FIRE DEPARTMENT CONNECTIONS

916.1 Required: All required water fire-extinguishing and *standpipe systems* shall be provided with a fire department connection in accordance with the applicable standards. *Standpipes* in buildings under construction or demolition shall conform to Section 3305.3.

Exceptions

1. *Limited area sprinkler systems* supplied from the domestic water system.
2. Where the local fire department approves a single connection for large diameter hose of at least 4 inches (102 mm).
3. An *automatic sprinkler system* with less than 20 *sprinklers*.

916.2 Connections: Fire department connections shall be arranged in such a manner that the attachment to any one water *sprinkler* connection will serve all *sprinklers*, and the attachment to any one *standpipe* connection will serve all *standpipes* within the building.

916.3 Location: Fire department connections shall be located and shall be visible on a street front or in a location approved by the fire department. Such connections shall be located so that immediate access is provided to the fire department. Fire department connections shall not be obstructed by fences, brushes, trees, walls or any other similar object.

916.4 Height: Fire department connections shall not be less than 18 inches (457 mm) and not more than 42 inches (1067 mm) in elevation, measured from the ground level to the centerline of the inlets.

916.5 Projection: Where the fire department connection will otherwise project beyond the property line or into the *public way*, a flush-type fire department connection shall be provided.

916.6 Hose thread: Hose thread in the fire department connection shall be uniform with that used by the local fire department.

916.7 Fittings: Fire department inlet connections shall be fitted with check valves, ball drip valves and plugs with chains or frangible caps.

916.8 Signs: A metal sign with raised letters at least 1 inch (25 mm) in height shall be mounted on all fire department connections serving *sprinklers* or *standpipes*. Such signs shall read "Automatic Sprinklers" or "Standpipe," or both, as applicable.

SECTION 917.0 YARD HYDRANTS

917.1 Fire hydrants: Fire hydrants installed on private property shall be located and installed as directed by the fire department. Hydrants shall conform to the standards of the administrative authority of the jurisdiction and the fire department. Hydrants shall not be installed on a water main less than 6 inches (152 mm) in diameter.

SECTION 918.0 FIRE ALARM SYSTEMS

918.1 General: Fire alarm systems shall be of an approved type and shall be installed in accordance with the provisions of this code and NFPA 72 listed in Chapter 35.

918.2 Construction documents: Where a fire alarm system is required by this code, the *construction documents* shall show the location and number of all alarm-initiating devices and alarm-notification appliances, and shall provide a description of all equipment to be used, proposed zoning, a list of auxiliary control functions (i.e., elevator capture), location of the control panel(s) and annunciator(s), and a complete sequence of operation for the system.

918.3 Approval: All devices, combinations of devices, appliances and equipment shall be approved for the fire alarm purpose for which such equipment is used.

918.4 Where required: A fire alarm system shall be installed and maintained in full operating condition in the locations described in Sections 918.4.1 through 918.4.6.

918.4.1 Use Group A-4 or E: A fire alarm system shall be installed and maintained in all occupancies in Use Group A-4 or E. A fire alarm system shall not be required for sanctuary and nave areas of churches and similar religious buildings.

918.4.2 Use Group B: A fire alarm system shall be installed and maintained in all occupancies in Use Group B where such buildings have occupied floors which are two or more stories above the lowest *level of exit discharge* or which have floors two or more stories below the highest *level of exit discharge*.

918.4.3 Use Group H: A fire alarm system shall be installed and maintained in all occupancies in Use Groups H-2, H-3 and H-4.

918.4.4 Use Group I: A fire alarm system shall be installed and maintained in all occupancies in Use Group I.

918.4.5 Use Group R-1: A fire alarm system shall be installed and maintained in all occupancies in Use Group R-1.

918.4.6 Use Group R-2: A fire alarm system shall be installed and maintained in all occupancies in Use Group R-2 where any *dwelling unit* is located three or more stories above the lowest *level of exit discharge* or more than one story below the highest *level of exit discharge* of *exits* serving the *dwelling unit*.

918.5 Location: Manual fire alarm boxes shall be located not more than 5 feet (1524 mm) from the entrance to each *exit*.

Exception: Manual fire alarm boxes are not required in an occupancy in Use Group B where the highest occupied floor is 75 feet (22860 mm) or less above the lowest level of fire department vehicle access and the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 906.0.

918.5.1 Manual fire alarm boxes: The height of the manual fire alarm boxes shall be a minimum of 42 inches (1067 mm) and a maximum of 54 inches (1372 mm) measured vertically, from the floor level to the activating handle or lever of the box. Manual fire alarm boxes shall be red in color. In all occupancies in Use Group I-3, the manual fire alarm boxes shall be permitted to be locked in areas where staff is present whenever such areas are occupied and keys are readily available to unlock the boxes, or the boxes shall be located in a manned staff location which has direct supervision of the sleeping area.

918.6 Power supply: The primary and secondary power supply for the fire alarm system shall be provided in accordance with NFPA 72 listed in Chapter 35.

918.7 Wiring: All wiring shall conform to the requirements of NFPA 72 listed in Chapter 35. Wireless systems utilizing radio-frequency transmitting devices shall comply with the special requirements for supervision of low-power wireless systems in NFPA 72 listed in Chapter 35.

918.7.1 Activation: The alarm-notification appliances shall be automatically activated by all of the following where provided:

1. Smoke detectors, other than single- and multiple-station smoke detectors, as required by Section 920.0;
2. *Sprinkler* water-flow devices;
3. Manual fire alarm boxes; and
4. Other approved types of automatic fire detection devices or *suppression systems*.

Exception: Smoke detectors in an occupancy in Use Group I-3 are permitted to actuate an audible alarm-notification appliance at a constantly attended location and are not required to activate a general alarm.

918.7.2 Presignal system: Presignal systems shall not be installed unless approved by the code official and by the fire department. Where a presignal system is installed, 24-hour personnel supervision shall be provided at a location approved by the fire department, in order that the alarm signal can be actuated in the event of fire or other emergency.

918.7.3 Zones: Each floor shall be zoned separately and a zone shall not exceed 20,000 square feet (1860 m^2). The length of any zone shall not exceed 300 feet (91440 mm) in any direction. A zoning indicator panel and the associated controls shall be provided in an approved location. The visual zone indication shall lock in until the system is reset and shall

not be cancelled by the operation of an audible alarm-silencing switch. In buildings that have floors located more than 75 feet (22860 mm) above the lowest level of fire department vehicle access which are occupied for human occupancy, a separate zone by floor shall be provided for the following types of alarm-indicating devices where provided:

1. Smoke detectors;
2. *Sprinkler* water-flow devices;
3. Manual fire alarm boxes; and
4. Other approved types of automatic fire detection devices or *suppression systems*.

Exception: *Automatic sprinkler system* zones shall not exceed the area permitted by NFPA 13 listed in Chapter 35.

918.8 Alarm-notification appliances: Alarm-notification appliances of the approved type shall be provided.

918.8.1 Visible alarms: Visible alarm-notification appliances shall be provided in public and common areas. In occupancies in Use Groups I-1 and R-1, all required accessible sleeping rooms and suites plus an additional number of sleeping rooms or suites in accordance with Table 918.8.1 shall be provided with a visible alarm-notification appliance, activated by both the in-room smoke detector and the building fire alarm system. In occupancies of Use Group R-2 required by Section 918.4.6 to have a fire alarm system, all dwelling units shall be provided with the capability to support visable alarm-notification appliances in accordance with ICC A117.1.

Table 918.8.1
VISIBLE ALARMS

Number of sleeping rooms or suites	Minimum required number of sleeping rooms or suites with visible alarms
6 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1,000	2% of total
1,001 and over	20 plus 1 for each 100 over 1,000

918.8.2 Audible alarms: Audible alarm-notification appliances shall be provided and shall sound a distinctive sound which shall not be used for any purpose other than that of a fire alarm. The audible alarm-notification appliances 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 occupancies in Use Groups R and I-1; 90 dBA in mechanical equipment rooms; and 60 dBA in all other use groups. The maximum sound pressure level for audible alarm-notification appliances shall be 130 dBA at the minimum hearing distance from the audible appliance. Where the average ambient noise is greater than 115 dBA, visible alarm-notification appliances shall be provided in accordance with NFPA 72 listed in Chapter 35 and audible alarm-notification appliances shall not be required.

918.9 Voice/alarm signaling system: A voice/alarm signaling system shall be provided where required by other sections of this code. When activated in accordance with Section 918.7.1, the voice/alarm signaling system shall automatically sound an alert signal to all occupants within the building on a general or selective basis to the following terminal areas: elevators, elevator lobbies, *corridors*, *exit stairways*, rooms and tenant spaces exceeding 1,000 square feet (93 m^2) in area; *dwelling units* in occupancies in Use Group R-2; and guestrooms or suites in occupancies in Use Group R-1. The *fire command station* shall contain controls to transmit manually an evacuation signal and voice instructions on a selective and all-call basis to the terminal areas indicated herein. The voice/alarm system shall be installed in accordance with the provisions of this code and NFPA 72 listed in Chapter 35.

Exception: A distinctive signal in lieu of a voice alarm is permitted in an occupancy in Use Group F or S.

918.10 Acceptance tests: Upon completion of the fire alarm system, all alarm-notification devices and circuits, alarm-notification appliances and circuits, supervisory-signal initiating devices and circuits, signaling line circuits, and primary and secondary power supplies shall be subjected to a 100-percent acceptance test in accordance with NFPA 72 listed in Chapter 35.

SECTION 919.0 AUTOMATIC FIRE DETECTION SYSTEMS

919.1 General: Automatic fire detection systems shall be of an approved type and shall be installed in accordance with the provisions of this code and NFPA 72 listed in Chapter 35.

919.2 Construction documents: Where an automatic fire detection system is required by this code, the *construction documents* shall show the location and number of all *automatic fire detectors* with specifications of the type of fire detector, proposed zoning and a complete sequence of operation for the system. The system shall be installed in accordance with this section and shall be part of and be subject to the requirements of a fire alarm system specified in Section 918.0.

919.3 Approval: All devices, combinations of devices, appliances and equipment shall be approved for the fire signaling purpose for which such equipment is used. The *automatic fire detectors* shall be smoke detectors, except an approved alternative type of detector shall be installed in spaces such as boiler rooms where, during normal operation, products of combustion are present in sufficient quantity to actuate a smoke detector.

919.4 Where required: An automatic fire detection system shall be installed and maintained in full operating condition in the locations described in Sections 919.4.1 through 919.4.4.

919.4.1 Use Group I-1: An automatic fire detection system shall be installed and maintained in all occupancies in Use Group I-1.

919.4.2 Use Group I-2: An automatic fire detection system shall be installed and maintained in all occupancies in Use Group I-2 other than Use Group I-2 occupancies that are equipped throughout with an *automatic sprinkler system* in

accordance with Section 906.0 and that comply with Section 409.0.

919.4.3 Use Group I-3: An automatic fire detection system shall be installed and maintained in all resident housing areas of Use Group I-3. Smoke detectors shall be arranged and positioned to prevent damage or tampering, provided that the function and speed of detecting a fire is equivalent to that provided by the spacing and arrangement requirements of NFPA 72 listed in Chapter 35. Smoke detectors shall not be required in sleeping rooms with four or less occupants.

919.4.4 Use Group R-1: An automatic fire detection system shall be installed and maintained in all occupancies in Use Group R-1.

Exceptions

1. An automatic fire detection system is not required in buildings that do not have interior *corridors* serving guestrooms and where all guestrooms have a *means of egress* door opening directly to an exterior *exit access* which leads directly to the *exits*.
2. System smoke detectors are not required in guestrooms provided that the single-station detectors required by Section 920.3.1 are connected to the emergency electrical system and are annunciated by guestroom at a constantly attended location from which the fire alarm system is capable of being manually activated.

919.5 Sprinklered buildings exception: Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 906.2.1 or 906.2.2 are not required to be equipped with an automatic fire detection system, but are required to be equipped with a fire alarm system that conforms to Section 918.0. This exception does not apply to Use Groups I-2 and I-3, to high-hazard use groups in accordance with Section 417.5.3, to special amusement buildings in accordance with Section 413.0, or to single-station smoke detectors as required in Section 920.3.

919.6 Zones: Zoning shall be provided in accordance with Section 918.7.3.

919.7 Alarm verification: Alarms activated by smoke detectors required by this section shall be activated 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.

919.8 Local control functions: *Automatic fire detectors* utilized for the purpose of performing local control functions shall be a part of a fire alarm system. The detector shall, upon actuation, perform the intended function and activate the alarm-notification devices or activate a visible and audible supervisory signal at a constantly attended location. In buildings not required to be equipped with a fire alarm system, the *automatic fire detector* shall be powered by normal electrical service and, upon actuation, perform the intended function. The detectors shall be located in accordance with NFPA 72 listed in Chapter 35.

919.9 Access: Access shall be provided to each detector for periodic inspection, maintenance and testing.

919.10 Other required automatic fire detection systems: In addition to the requirements of this section, the sections of this code indicated in Table 919.10 also require the installation of an automatic fire detection system or automatic fire detectors for certain buildings and areas.

Table 919.10
ADDITIONAL REQUIRED FIRE DETECTORS OR SYSTEMS

Section	Subject
403.4	High-rise buildings
405.5.1	Underground structures
409.5.1	Use Group I-2
413.3	Special amusement buildings
414.4	Air traffic control towers
416.9.2	HPM facilities
417.5.3	Use Group H
922.4.2	Smoke control systems
1015.8	Smokeproof enclosure ventilation equipment

SECTION 920.0 SINGLE- AND MULTIPLE-STATION SMOKE DETECTORS

920.1 General: Single- and multiple-station smoke detectors shall be of an approved type and shall be installed in accordance with the provisions of this code and the household fire warning equipment provisions of NFPA 72 listed in Chapter 35.

920.2 Construction documents: Where single- and multiple-station smoke detectors are required by this code, the *construction documents* shall show the location and number with specifications of the type of detector.

920.3 Where required: Single- or multiple-station smoke detectors shall be installed and maintained in full operating condition in the locations described in Sections 920.3.1 through 920.3.3.

920.3.1 Use Group R-1: Single- or multiple-station smoke detectors shall be installed and maintained in the following locations in Use Group R-1:

1. In all sleeping areas;
2. In every room in the path of the *means of egress* from the sleeping area to the door leading from the guestroom or suite; and
3. In each story within the guestroom or suite, including *basements*. For guestrooms or suites 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.

920.3.2 Use Groups R-2 and R-3: Single- or multiple-station smoke detectors shall be installed and maintained in all occupancies in Use Groups R-2 and R-3 at the following locations:

1. In the immediate vicinity of bedrooms;
2. In all bedrooms; and
3. In each story within a *dwelling unit*, including *basements*.

Exceptions

1. 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.

2. In buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 906.2.1, 906.2.2 or 906.2.3, smoke detectors are not required in bedrooms where the bedrooms are equipped with residential *sprinklers*.

920.3.3 Use Group I-1: Single- or multiple-station smoke detectors shall be installed and maintained in all sleeping areas in occupancies in Use Group I-1. Single or multiple station smoke detectors shall not be required where the building is equipped throughout with an automatic detection system in accordance with Section 919.4.1.

920.4 Interconnection: Where more than one detector is required to be installed within an individual *dwelling unit* in an occupancy in Use Group R-2 or R-3, or within an individual guestroom or suite in an occupancy in Use Group R-1, the detectors shall be interconnected in such a manner that the actuation of one alarm will actuate all of the alarms in the individual unit.

920.5 Battery backup: In addition to the required AC primary power source, required smoke detectors in occupancies in Use Groups R-2, R-3 and I-1 shall receive power from a battery when the AC primary power source is interrupted. Battery backup shall not be required for smoke detectors in buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 906.2.1, 906.2.2 or 906.2.3.

920.6 Acceptance testing: When the installation of the detectors is complete, each detector — and all interconnecting wiring for multiple-station detectors — shall be subject to a 100-percent acceptance test in accordance with the household fire warning equipment provisions of NFPA 72 listed in Chapter 35.

SECTION 921.0 FIRE EXTINGUISHERS

921.1 Approval: Portable fire extinguishers shall bear the *label* of an *approved agency*, be of an approved type and be installed in a location visible and available to the occupants.

921.2 Where required: A portable fire extinguisher shall be installed in the following locations in accordance with NFPA 10 listed in Chapter 35:

1. In all occupancies in Use Group A-1, A-2, A-3, E, I-2, R-1 or H;
2. In all areas containing commercial kitchen exhaust hood systems;
3. In all areas where fuel is dispensed;
4. In all areas where a *flammable* or *combustible liquid* is used in the operation of spraying, coating or dipping;
5. In all occupancies in Use Group I-3 at staff locations. Access to portable extinguishers shall be permitted to be locked;
6. On each completed floor of buildings under construction, other than occupancies in Use Group R-3;
7. In any laboratory, shop or other room occupied for similar purposes; and
8. Where required by the fire prevention code listed in Chapter 35.

SECTION 922.0 SMOKE CONTROL SYSTEMS

922.1 General: Smoke control systems required by this code shall conform to the provisions of this section.

922.2 Design criteria: The limiting height of the smoke interface above the floor of the space required to be provided with smoke control is Z_{cr}. Provisions shall also be made to provide for smoke removal from the space at a rate of not less than two air changes per hour by means of natural or mechanical *ventilation*. The specific design criteria in the applicable sections listed in Table 922.7 shall apply.

922.2.1 Passive system: Active smoke control is not required where it is shown that the smoke interface level requirement will be met without operating smoke exhaust.

922.2.1.1 Regular spaces: For spaces with flat ceilings, a constant horizontal cross-sectional area above the smoke layer interface, and an A/H^2 ratio between 0.9 and 14, the following equation shall be used to estimate the height of the interface at 20 minutes:

$$Z = 0.67H - 0.28H \ln\left[\frac{t Q^{1/3} H^{2/3}}{A}\right]$$

where:

Z = Height from floor to the smoke interface (feet).
t = Time for interface to descend to Z; Use 1,200 seconds.
H = Height of the space required to be provided with smoke control; floor to flat ceiling (feet).
Q = Steady state heat release rate; Use 4,400 Btu/sec. where the primary use group is M, S-1 or F-1. Otherwise use 2,000 Btu/sec.
A = Horizontal cross-sectional area of the above ceiling space being filled (square feet). Maximum A to be used shall be: $A = 14\ H^2$.

922.2.1.2 Irregular spaces: For spaces with sloped or irregular ceilings, A/H^2 ratios outside the specified range, or varying cross sections, the filling time shall be determined using numerical integration from the ceiling to the critical smoke interface. The following equations shall be used to determine the rate of smoke production:

Where the interface level is above the limiting elevation (z_l) use:

$$V = 17.6 Q_c^{1/3} Z^{5/3} + 3.36 Q_c$$

Where the interface level is below the limiting elevation (z_l) use:

$$V = 16.64 Q_c^{3/5} Z$$

where:

V = The volumetric rate of smoke production (cubic feet per minute).
z_l = Limiting elevation (feet) = $0.533\ Q_c^{2/5}$.
Q_c = The convective portion of the heat release rate shall be estimated as 70 percent of the total heat release rate, Q.

922.2.2 Mechanical systems: Where the smoke filling predicted in Section 922.2.1 does not meet the design criteria of Section 922.2, mechanical exhaust shall be provided to maintain these conditions.

922.2.2.1 Exhaust quantities: Sufficient mechanical exhaust shall be provided to maintain the smoke layer interface at or above the critical elevation for the 20-minute period. The volumetric rate of smoke production (V) shall be determined by the equations in Section 922.2.1.2. If the rate of smoke exhaust is less than the rate of smoke production, the minimum exhaust rate to be supplied for smoke control shall be determined in accordance with Table 922.2.2.1.

Table 922.2.2.1
MINIMUM EXHAUST RATE ADJUSTMENT FACTOR[a]

Z/H	t/t_o					
	V_e/V					
	0.25	0.35	0.50	0.70	0.85	0.95
0.2	1.12	1.19	1.30	1.55	1.89	2.49
0.3	1.14	1.21	1.35	1.63	2.05	2.78
0.4	1.16	1.24	1.40	1.72	2.24	3.15
0.5	1.17	1.28	1.45	1.84	2.48	3.57
0.6	1.20	1.32	1.52	2.00	2.78	4.11
0.7	1.23	1.36	1.61	2.20	3.17	4.98
0.8	1.26	1.41	1.71	2.46	3.71	6.25

Note a. Notation:
Z = Design height of smoke layer interface above fire source.
H = Ceiling height above fire source.
t = Time for smoke layer interface to descend to Z (with exhaust) (seconds).
t_o = Value of t in absence of smoke exhaust (see Section 922.2.1.1 or 922.2.1.2) (seconds).
V_e = Smoke control exhaust rate (minus any airflow into the smoke layer other than that from the plume).
V = Volumetric smoke production rate (from the equations in Section 922.2.1.2).

922.2.3 Operation: The smoke control system shall be a dedicated system or shall be integrated with the mechanical *ventilation* system of the building. Operation of the smoke control system shall automatically shut down all systems and devices which interfere with the effective operation of the smoke control system. Where the mechanical *ventilation* system is designed for smoke control, the return air shall be moved directly to the outside without recirculation to other areas of the building.

922.2.4 Alternative systems: An engineered design which will achieve the same level of smoke control as described in this section is permitted in lieu of these requirements.

922.3 Smoke removal: Provisions shall be made to provide *ventilation* at a rate of at least two air changes per hour from the space required to be provided with smoke control. This *ventilation* shall be through openable vents, separate mechanical exhaust, or through the building mechanical *ventilation* system. The exhaust inlets shall be located a minimum of 6 feet (1829 mm) above any *exit access* walkway and above any openings into adjoining spaces. The smoke removal system shall be activated by manual controls provided for fire department use unless it is part of the smoke control system.

922.4 Activation: The smoke control system shall be activated by actuation of the following:

1. *Automatic sprinkler system*;
2. Smoke detectors required by this section that comply with NFPA 72 listed in Chapter 35; and
3. Manual controls provided for fire department use.

The system shall not be activated by a manual fire alarm system.

922.4.1 Manual control: Manual controls shall be provided at a location approved by the fire department.

922.4.2 Smoke detector activation: Where the height of the ceiling of the space required to be provided with smoke control exceeds 30 feet (9144 mm) above the floor of the space, approved smoke detectors shall be provided to detect smoke above the highest floor open to an atrium or at the highest point of another space required to be provided with smoke control. The installation of smoke detectors shall comply with Section 919.0.

922.5 Standby power: All equipment required to provide smoke control in floor openings connecting three or more stories and stage areas in accordance with Section 412.3.8.2 shall be equipped with a standby source of power that complies with Section 2707.0.

922.6 Acceptance: Any required smoke control design that requires operation of mechanical equipment shall be functionally tested in accordance with Section 922.6.2 until proper operation of all required mechanical equipment and controls is demonstrated.

922.6.1 System operation report: Prior to acceptance testing, a report of the required system operations shall be provided to the code official. The following items shall be included in the report if part of the required system:

1. Identify type(s) of smoke control activation signal(s), such as *sprinkler* waterflow, smoke detection, manual, etc., and associated smoke control system operation(s) that are activated by the signals.
2. Identify *building area(s)* where maximum mechanical exhaust to the outside is implemented and supply air is not provided.
3. Identify *building area(s)* where maximum air supply is implemented and exhaust to the outside is not provided.
4. Identify fan(s) which shall be "On" as required to implement the smoke control system. If multiple-speed fans are used, the capacity at which the fans shall operate in the smoke control mode shall be identified.
5. Identify fan(s) which shall be "Off" as required to implement the smoke control system.
6. Identify damper(s) which shall be "Open" to implement the smoke control system.
7. Identify damper(s) which shall be "Closed" to implement the smoke control system.
8. Identify other functions required to implement the smoke control system.
9. Identify *building areas* with smoke and heat vents and method of operation of vents.
10. If required, identify the type(s) of standby power and the equipment that is served.

922.6.2 Testing procedures: The acceptance test procedure shall be approved. Acceptance testing shall be conducted in the presence of the code official or shall include documentation indicating that all mechanical equipment, control

sequences, devices and components have been operationally tested and are functioning properly in accordance with the system operation report. All documentation from operational testing shall be available for inspection. Acceptance testing shall include the following:

1. Prior to beginning acceptance testing, all building smoke control equipment shall be placed in the normal operating mode.
2. Acceptance testing shall demonstrate that each initiating device, fan, damper and other required equipment is operational and performs to the limits and capacity required.
3. Acceptance testing shall demonstrate that correct control outputs are produced for a given control input for each control sequence specified by the system operation report.
4. If standby power is required for the operation of the smoke control system, acceptance tests shall be conducted while on both normal building power and standby power.
5. Opening of smoke/heat vents shall be demonstrated if the vent is capable of being opened in a manner that does not require destructive testing.

922.7 Other requirements: In addition to this section, the sections indicated in Table 922.7 contain other requirements for the installation of smoke control systems for certain buildings and areas.

Table 922.7
OTHER REQUIRED SMOKE CONTROL SYSTEMS

Section	Subject
402.7.1	Anchor stores
404.4	Atriums
405.5	Underground structures
410.8	Windowless buildings (Use Group I-3)
412.3.8.2	Stages (alternative)
1013.3.3	Grandstands
1015.5 & 1015.6	Smokeproof enclosures
3408.6.10	Compliance alternatives

SECTION 923.0 SMOKE AND HEAT VENTS

923.1 General: Where *exit access* travel distance is increased in accordance with Section 1006.5.1, smoke and heat vents shall be constructed and installed in accordance with this section.

923.2 Vent size and spacing: The vent area and the spacing of the vents shall comply with Table 923.2.

923.2.1 Smoke and heat vents: Smoke and heat vents shall be labeled and shall be designed to open automatically by activation of any one of the following:

1. A fixed temperature heat-responsive device rated between 100 degrees F. (56 degrees C.) to 220 degrees F. (122 degrees C.) above ambient,
2. A rate-of-rise device, or
3. Heat-sensitive glazing designed to shrink and drop out of the vent opening.

The vent shall fully open when it is exposed to a time temperature gradient that reaches an air temperature of 500 degrees F. (260 degrees C.) within 5 minutes. Smoke and heat vents shall be capable of being opened by an approved manual operation.

923.3 Curtain board construction: Curtain boards shall be provided to subdivide a vented building. Curtain boards shall be constructed of material that will resist the passage of smoke and is consistent with the building type of construction. Curtain board location and depth shall comply with Table 923.2. The bottom of the curtain board shall be level.

SECTION 924.0 SUPERVISION

924.1 Fire suppression systems: All *automatic fire suppression systems* required for occupancies in Use Group A, B, E, H, I, M or R shall be supervised by method 1. All *automatic fire suppression systems* in other use groups shall be supervised by one of the following methods:

1. Central-station system, proprietary system, remote-station system or supervisory service which will cause the actuation of an audible appliance at a constantly attended location, in accordance with NFPA 72 listed in Chapter 35; or
2. Locking open all valves on connections to *water supplies*, sectional control valves and other valves in supply pipes to fire protection devices.

Exceptions

1. Underground gate valves with roadway boxes.
2. Halogenated extinguishing systems that are not an integral part of a required *automatic fire suppression system.*
3. Carbon dioxide extinguishing systems that are not an integral part of a required *automatic fire suppression system.*
4. Dry- and wet-chemical extinguishing systems.
5. *Limited area sprinkler systems* (see Section 907.6.3).
6. Occupancies in Use Group R complying with Section 906.2.2 and supervised in accordance with NFPA 13R listed in Chapter 35.

924.2 Fire alarm systems: All required fire alarm systems shall transmit alarm and trouble signals to an approved central-station system, proprietary system or remote-station system.

Exceptions

1. Fire alarm and automatic fire detection systems in occupancies in Use Group R in buildings that are less than five stories in *height.*
2. Single- and multiple-station detectors as required by Section 920.0.
3. Smoke detectors in occupancies in Use Group I-3 (see Section 918.7.1).
4. Smoke detectors in patient sleeping rooms in occupancies in Use Group I-2 (see Section 409.5.1).
5. Fire alarm systems in occupancies in Use Groups H-2, H-3 and H-4 as required by Section 918.4.3.

Table 923.2
SMOKE AND HEAT VENT SIZE AND SPACING[b]

Use Group	Hazard classification of contents[a]	Vent height above the floor, H (feet)	Minimum curtain board depth from vent bottom (feet)	Maximum area formed by curtain boards (square feet)	Vent area to floor area ratio	Maximum spacing of vent centers (feet)	Maximum distance from wall of curtain boards (feet)	Maximum distance between curtain boards
F-1	—	—	$0.2 \times H$ but ≥ 4	50,000	1:100	120	60	$8 \times H$ but ≤ 250 feet
S-1	I thru IV	20 or less	6	10,000	1:100	100	60	$8 \times H$
S-1	I thru IV	Over 20 to 40	6	8,000	1:75	100	55	$8 \times H$ but ≤ 250 feet
S-1	I thru IV	20 or less	4	3,000	1:75	100	55	$8 \times H$
S-1	I thru IV	Over 20 to 40	4	3,000	1:50	100	50	$8 \times H$ but ≤ 250 feet
S-1	V	20 or less	6	6,000	1:50	100	50	$8 \times H$
S-1	V	Over 20 to 30	6	6,000	1:40	90	45	$8 \times H$
S-1	V	30 or more	4	2,000	1:30	75	40	$8 \times H$ but ≤ 100 feet

Note a. See NFPA 231C listed in Chapter 35 for classification of Contents Class I through IV. Class V commodities are products that present special fire hazards beyond those of Class I, II, III or IV, such as aerosols, foam plastic, PVC, PU, PS and asphalt paper.
Note b. 1 foot = 304.8 mm; 1 square foot = 0.093 m^2.