

NFPA 1

Fire Prevention Code

2000 Edition



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An International Codes and Standards Organization

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NFPA 1

Fire Prevention Code

2000 Edition

This edition of NFPA 1, *Fire Prevention Code*, was prepared by the Technical Committee on Fire Prevention Code and acted on by the National Fire Protection Association, Inc., at its November Meeting held November 14–17, 1999, in New Orleans, LA. It was issued by the Standards Council on January 14, 2000, with an effective date of February 11, 2000, and supersedes all previous editions.

This edition of NFPA 1 was approved as an American National Standard on February 11, 2000.

Origin and Development of NFPA 1

This code was originally developed as a result of the requests of many members of the National Fire Protection Association for a document covering all aspects of fire protection and prevention that used the other developed NFPA codes and standards. NFPA staff initiated this work in 1971 upon a directive from the NFPA Board of Directors.

The original code was written around a format that served as a guide for the development of a local fire prevention code. Prerogatives of local officials were excluded from the main text of the document but included within appendices as guidance for exercising desired prerogatives.

In the late 1980s, the Fire Marshals Association of North America undertook the task of developing a code that was more self-contained, adding administrative sections and extracting heavily from other NFPA codes and standards. The draft was submitted to the Fire Prevention Code Committee. The Committee examined changes in the built environment as it is affected by fire and incorporated significant portions of the *Life Safety Code*®. A special task group on hazardous materials examined technological changes in the handling, storage, and use of flammable and combustible materials. Chapters extracting hazardous material requirements placed a greater emphasis on protection of life and property from chemical products made and used in the environment. A major rewrite resulted in the 1992 edition of the *Fire Prevention Code*.

The 1997 edition updated the text extracted from other NFPA codes and standards and added compliance with additional NFPA codes and standards as part of the requirements of NFPA 1.

The 2000 edition of NFPA 1 is a complete revision that updates the text extracted from other NFPA codes and standards. Additional direct references from NFPA codes and standards that are essential to a code official's use of the document were added. The Committee also added a new section on performance-based design as a valuable tool for code officials and design professionals. NFPA 1 was restructured to be more functional with respect to administration, code enforcement, and regulatory adoption processes.

The extracts contained in NFPA 1 reflect the technical knowledge of the originating committees who are responsible for the codes and standards from which the text is extracted. This Code is intended to provide local jurisdictions with an effective local fire prevention code.

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This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents on a Fire Prevention Code that includes appropriate administrative provisions, to be used with the National Fire Codes for the installation, operation, and maintenance of buildings, structures, and premises for the purpose of providing safety to life and property from fire and explosion. This includes development of requirements for, and maintenance of, systems and equipment for fire control and extinguishment. Safety to life of occupants of buildings and structures is under the primary jurisdiction of the Committee on Safety to Life.

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Appendix A.

Information on referenced publications can be found in Chapter 32 and Appendix D.

A reference in parentheses () following a section or paragraph indicates material that has been extracted from another NFPA document. The complete title and edition of the document the material is extracted from is found in Chapter 32. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the appropriate technical committee.

Chapter 1 Administration and Enforcement

1-1 Title. The title of this Code shall be NFPA 1, *Fire Prevention Code*, of the National Fire Protection Association. The short title of this Code shall be the NFPA *Fire Prevention Code*.

1-2 Purpose.

1-2.1 The purpose of this Code is to prescribe minimum requirements necessary to establish a reasonable level of fire safety and property protection from the hazards created by fire and explosion.

1-2.2 This Code is partially comprised of limited text references extracted from other NFPA codes and standards in an effort to bring together information useful during field inspections. (*See 1-5.4 relative to conflicts of application.*)

1-3 Scope. The scope covers the construction, maintenance, and use of property to the extent that such is not covered by other existing NFPA codes and standards. When other codes and standards are applicable to the scope of this Code, they are referenced herein. The provisions of this Code are applicable to the following:

- (1) The inspection of buildings, processes, equipment, systems, and other fire and related life safety situations
- (2) The investigation of fires, explosions, hazardous materials incidents, and other related emergency incidents handled by the fire department
- (3) The review of construction plans, drawings, and specifications for life safety systems, fire protection systems, access, water supplies, processes, and hazardous materials and other fire and life safety issues
- (4) The fire and life safety education of fire brigades, employees, responsible parties, and the general public
- (5) Existing occupancies and conditions, the design and construction of new buildings, remodeling of existing buildings, and additions to existing buildings
- (6) The storage, use, processing, handling, and on-site transportation of hazardous materials
- (7) The design, alteration, modification, construction, maintenance, and testing of fire protection systems and equipment
- (8) Access requirements for fire department operations
- (9) Hazards from outside fires in vegetation, trash, building debris, and other materials
- (10) The regulation and control of special events including but not limited to exhibits, trade shows, amusement parks, haunted houses, and other similar special occupancies
- (11) The interior finish, decorations, furnishings, and other combustibles that contribute to fire spread, fire load, and smoke production
- (12) The storage, use, processing, handling, and on-site transportation of flammable and combustible gases, liquids, and solids

1-4 Authority.

1-4.1 This Code shall be administered and enforced by the authority having jurisdiction designated by the governing authority.

1-4.2 Police and other enforcement agencies shall have authority to render necessary assistance in the enforcement of this Code when requested to do so by the authority having jurisdiction.

1-4.3 The authority having jurisdiction shall be permitted to delegate to other qualified individuals such powers as necessary for the proper administration and enforcement of this Code.

1-4.4 The authority having jurisdiction shall be authorized to inspect, at all reasonable times, any building or premises for dangerous or hazardous conditions or materials as set forth in this Code. The authority having jurisdiction shall have authority to order any person(s) to remove or remedy such dangerous or hazardous condition or material. Any person(s) failing to comply with such order shall be in violation of this Code.

1-4.5 Where conditions exist and are deemed hazardous to life and property by the authority having jurisdiction, the authority having jurisdiction shall have the authority to summarily abate such hazardous conditions that are in violation of this Code.

1-4.6 To the full extent permitted by law, any authority having jurisdiction engaged in fire prevention and inspection work shall be authorized at all reasonable times to enter and examine any building, structure, marine vessel, vehicle, or premises for the purpose of making fire safety inspections. Before entering a private dwelling, the authority having jurisdiction shall obtain the consent of the occupant thereof or obtain a court warrant authorizing entry for the purpose of inspection except in those instances where an emergency exists. As used in this section, *emergency* means circumstances that the authority having jurisdiction knows, or has reason to believe, exist and that reasonably can constitute immediate danger to life and property.

1-4.7 Persons authorized to enter and inspect buildings, structures, marine vessels, vehicles, and premises as herein set forth shall be identified by proper credentials issued by this governing authority.

1-4.8 Persons shall not interfere with an authority having jurisdiction carrying out any duties or functions prescribed by this Code.

1-4.9 Persons shall not use a badge, uniform, or other credentials to impersonate the authority having jurisdiction.

1-4.10 The authority having jurisdiction shall have the authority to investigate the cause, origin, and circumstances of any fire, explosion, or other hazardous condition. The authority having jurisdiction shall have the authority to take custody of

all physical evidence relating to the cause of the fire, explosion, or other hazardous condition. Information that could be related to trade secrets or processes shall not be made part of the public record except as might be directed by a court of law.

1-4.11 The authority having jurisdiction shall have the authority to require plans and specifications to ensure compliance with applicable codes and standards.

1-4.12 Whenever any installation subject to inspection prior to use is covered or concealed without having first been inspected, the authority having jurisdiction shall have the authority to require that such work be exposed for inspection. The authority having jurisdiction shall be notified when the installation is ready for inspection and shall conduct the inspection within a reasonable period of time.

1-4.13 When any construction or installation work is being performed in violation of the plans and specifications as approved by the authority having jurisdiction, a written notice shall be issued to the responsible party to stop work on that portion of the work that is in violation. The notice shall state the nature of the violation, and no work shall be continued on that portion until the violation has been corrected.

1-4.14 The authority having jurisdiction shall have the authority to order the immediate evacuation of any occupied building deemed unsafe when such building has hazardous conditions that present imminent danger to building occupants.

1-4.15 The authority having jurisdiction shall have the authority to develop and implement a public fire safety education program as deemed necessary for the general welfare with respect to the potential fire hazards within the jurisdiction.

1-4.16 The authority having jurisdiction shall have the authority to ensure that appropriate or duly authorized public fire safety education programs or public fire safety messages are disseminated to the general public.

1-5 Application.

1-5.1 This Code shall apply to both new and existing conditions.

1-5.2 Details regarding processes, methods, specifications, equipment testing and maintenance, design standards, performance, installation, or other pertinent criteria contained in those standards and codes listed in Chapter 32 of this Code shall be considered a part of this Code.

1-5.3 Applicable provisions of documents listed in Appendix D are not required but shall be permitted to be used by the authority having jurisdiction as appropriate criteria for meeting the intent of this Code when specific provisions do not exist within this Code or other nationally recognized codes or standards.

1-5.4 Where the requirement differs between this Code and referenced documents, the requirements of the referenced documents shall apply.

1-5.5 Buildings in existence or permitted for construction prior to the adoption of this Code shall comply with the provisions stated herein or referenced for existing buildings.

Existing buildings or installations that do not comply with the provisions of the publications referenced in 32-1.1 shall be permitted to be continued in use unless the authority having jurisdiction determines that the lack of conformity with these codes and standards presents an imminent danger.

Exception: A limited but reasonable time shall be allowed for compliance with any part of this Code for existing buildings, commensurate with the magnitude of expenditure, disruption of services, and degree of hazard. Occupied existing buildings shall comply with 1-9.2.

1-5.6 Buildings permitted for construction after the adoption of this Code shall comply with the provisions stated herein for new buildings.

1-5.7 When in fixed locations and occupied as buildings, vehicles, vessels, or other similar conveyances, as described by Section 11-6 of NFPA 101®, *Life Safety Code*®, shall be treated as buildings and comply with this Code.

1-5.8 Additions, alterations, or repairs to any building shall conform to that required of a new building without requiring the existing building to comply with all the requirements of this Code. Additions, alterations, or repairs shall not cause an existing building to become unsafe or adversely affect the performance of the building as determined by the authority having jurisdiction.

1-5.9 Where two or more classes of occupancy occur in the same building or structure and are so intermingled that separate safeguards are impracticable, means of egress facilities, construction, protection, and other safeguards shall comply with the most restrictive fire safety requirements of the occupancies involved.

1-6 Equivalencies and Alternatives.

1-6.1 Nothing in this Code is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety to those prescribed by this Code, provided technical documentation is submitted to the authority having jurisdiction to demonstrate equivalency and the system, method, or device is approved for the intended purpose.

1-6.2 The specific requirements of this Code shall be permitted to be modified by the authority having jurisdiction to allow alternative arrangements that will secure as nearly equivalent fire safety as practical, but in no case shall the modification afford less fire safety than, in the judgment of the authority having jurisdiction, that which would be provided by compliance with the corresponding provisions contained in this Code.

1-6.3 Buildings with alternative fire protection features approved by the authority having jurisdiction shall be considered as conforming with this Code.

1-6.4 Each application for an alternative fire protection feature shall be filed with the authority having jurisdiction and shall be accompanied by such evidence, letters, statements, results of tests, or other supporting information as required to justify the request. The authority having jurisdiction shall keep a record of actions on such applications, and a signed copy of the authority having jurisdiction's decision shall be provided for the applicant.

1-7* Performance-Based Design.

1-7.1* When a performance-based design is submitted to the authority having jurisdiction for review and approval, the submitter shall document, in an approved format, each performance objective and applicable scenario, including any calculations methods or models, used in establishing the proposed design's fire and life safety performance.

1-7.2 The authority having jurisdiction shall make the final determination as to whether the performance objectives have been met.

1-7.3 The design features required for the building to meet the performance goals and objectives shall be maintained and readily accessible to the authority having jurisdiction for the life of the building. The building shall be maintained in accordance with all documented assumptions and design specifications. Any proposed changes or variations from the approved design shall be approved by the authority having jurisdiction prior to the actual change.

1-7.4 Where a performance-based design is approved and used, the property owner shall annually certify that the design features and systems have been maintained in accordance with the approved performance-based design and assumptions.

1-8 Board of Appeals.

1-8.1 A Board of Appeals shall be established consisting of members and alternate members who shall be appointed by the appointing official of the jurisdiction by reason of education, experience, and knowledge and are deemed to be competent to sit in judgment on matters concerning NFPA 1, *Fire Prevention Code*, and its enforcement. The members shall serve for a term of three years, except for the initial appointees who shall serve as follows: two for a term of one year, two for a term of two years, and three for a term of three years.

1-8.2 Board members shall not be officers, agents, or employees of the jurisdiction. All members and any alternate members shall be appointed and shall serve in accordance with the terms and conditions of the authority having jurisdiction. The Board shall establish rules and regulations for conducting its business and shall render all decisions and findings in writing to the authority having jurisdiction, with a copy to the appellant.

1-8.3 No more than one of said members or their alternates shall be engaged in the same business, profession, or line of endeavor. No member of the Board of Appeals shall sit in judgment on any case in which the member, personally, is directly interested.

1-8.4 The Board of Appeals shall provide for reasonable interpretation of the provisions of this Code and rule on appeals from decisions of the authority having jurisdiction.

1-8.5 The Board of Appeals shall meet whenever directed by the appointing authority to interpret the provisions of this Code and to consider and rule on any properly filed appeal from a decision of the authority having jurisdiction, giving at least five days' notice of hearing, but in no case shall it fail to meet on an appeal within 30 calendar days of the filing of notice of appeal. All of the meetings of the board shall be open to the public.

1-8.6 Means of Appeals.

1-8.6.1 Any person shall be permitted to appeal a decision of the authority having jurisdiction to the Board of Appeals when it is claimed that any one or more of the following conditions exist:

- (1) The true intent of the codes or ordinances described in this Code has been incorrectly interpreted.
- (2) The provisions of the codes or ordinances do not fully apply.
- (3) A decision is unreasonable or arbitrary as it applies to alternatives or new materials.

1-8.6.2 An appeal shall be submitted to the authority having jurisdiction in writing within 30 calendar days of notification of violation outlining the Code provision from which relief is sought and the remedy proposed.

1-9 Occupancy.

1-9.1 No new construction or existing building shall be occupied in whole or in part in violation of the provisions of this Code.

1-9.2 Existing buildings that are occupied at the time of adoption of this Code shall remain in use provided that the following conditions are met:

- (1) The occupancy classification remains the same.
- (2) There exists no condition deemed hazardous to life or property that would constitute an imminent danger.

1-9.3* Buildings or portions of buildings shall not be occupied during construction, repair, or alteration without the approval of the authority having jurisdiction if required means of egress are impaired or required fire protection systems are out of service.

Exception: Routine maintenance or repair.

1-9.4* Changes of Occupancy.

1-9.4.1 In any building or structure, whether or not a physical alteration is needed, a change from one occupancy classification to another shall be permitted only where such a structure, building, or portion thereof conforms with the requirements of this Code or NFPA 101, *Life Safety Code*, that apply to new construction for the proposed new use or, where specifically permitted elsewhere in this Code or NFPA 101, *Life Safety Code*, existing construction features shall be permitted to be continued in use in conversions. (**101:4.6.11**)

1-9.4.2 Occupancy and subclassifications, as defined, shall be in accordance with NFPA 101, *Life Safety Code*.

1-10 Maintenance and Testing.

1-10.1 Whenever or wherever any device, equipment, system, condition, arrangement, level of protection, or any other feature is required for compliance with the provisions of this Code or NFPA 101, *Life Safety Code*, such device, equipment, system, condition, arrangement, level of protection, or other feature shall thereafter be continuously maintained in accordance with applicable NFPA requirements or as directed by the authority having jurisdiction. (**101:4.6.12.1**)

1-10.2* Any nonrequired system that creates an unsafe or hazardous condition shall be removed.

1-10.3* Existing life safety features obvious to the public, if not required by this Code or NFPA 101, *Life Safety Code*, shall be either maintained or removed. (**101:4.6.12.2**)

1-10.4 Equipment requiring periodic testing or operation to ensure its maintenance shall be tested or operated as specified elsewhere in this Code or in NFPA 101, *Life Safety Code*, or as directed by the authority having jurisdiction.

1-10.5 Maintenance and testing shall be under the supervision of a responsible person who shall ensure that testing and maintenance are made at specified intervals in accordance with applicable NFPA standards or as directed by the authority having jurisdiction. (**101:4.6.12.4**)

1-11 Records and Reports.

1-11.1 A record of examinations, approvals, and variances granted shall be maintained by the authority having jurisdiction and shall be available for public inspection during business hours in accordance with applicable laws.

1-11.2 The authority having jurisdiction shall keep a record of all fire prevention inspections, including the date of such inspections and a summary of any violations found to exist, the date of the services of notices, and a record of the final disposition of all violations.

1-11.3 All records required to be kept shall be maintained until their usefulness has been served or as otherwise required by law.

1-12 Duties and Powers of the Incident Commander.

1-12.1 The incident commander conducting operations in connection with the extinguishment and control of any fire, explosion, hazardous materials incident, natural disaster, rescue, and/or other emergency shall have authority to direct all operations of fire extinguishment, mitigation of a hazardous materials incident, natural disaster, rescue, and/or control and to take the necessary precautions to save life, protect property, and prevent further injury or damage. During such operation, including the investigation of the cause of such emergency, the incident commander shall be permitted to control or prohibit the approach to the scene of such emergency by any vehicle, vessel, or person.

1-12.2 No person shall obstruct the operations of the fire department in connection with extinguishing or control of any fire, or actions relative to other emergencies, or disobey any lawful command of the incident commander in charge of the emergency, or any part thereof, or any lawful order of a police officer assisting the fire department.

1-12.3 The incident commander in charge of an emergency scene shall have the authority to establish barriers to control access in the vicinity of such emergency and to place, or cause to be placed, ropes, guards, barricades, or other obstructions across any street or alley to delineate such emergency scene barrier. No person, except as authorized by the incident commander in charge of the emergency, shall be permitted to cross such barriers.

1-13 Owner/Occupant Responsibilities.

1-13.1 The owner, operator, or occupant shall be responsible for compliance with this Code.

1-13.2 The authority having jurisdiction shall be permitted to require tests or test reports as proof of compliance with the intent of this Code.

1-13.3 The owner, operator, or occupant of a building that is deemed unsafe by the authority having jurisdiction shall abate, through corrective action approved by the authority having jurisdiction, the condition causing the building to be unsafe either by repair, rehabilitation, demolition, or other corrective action approved by the authority having jurisdiction.

1-14 Fire Reporting and False Alarms.

1-14.1 The person discovering any unwanted fire, regardless of magnitude, shall take the following actions:

- (1) Immediately notify the person in charge of the premises and all occupants and guests in the immediate vicinity of the fire.
- (2) Notify the fire department.

Exception: This shall not apply to firms that have established on-premises fire-fighting organizations and have coordinated and arranged procedures approved by the authority having jurisdiction.

1-14.1.1* The owner, manager, occupant, or any person in control of such building or premises, upon discovery of an unwanted fire, or evidence of there having been an unwanted fire, even though it has apparently been extinguished, shall immediately cause notice of the existence of such fire, circumstances of same, and the location thereof to be given to the fire department.

1-14.1.2 No person shall make, issue, post, or maintain any regulation or order, written or verbal, that would require any person to take any unnecessary delaying action prior to reporting a fire to the fire department.

1-14.2 No person shall deliberately or maliciously turn in an alarm of fire when in fact that person knows that no fire exists.

1-14.3 It shall be a violation of this Code for any person to willfully make to the fire department any false, fraudulent, misleading, or unfounded report or statement or to willfully misrepresent any fact for the purpose of interfering with the orderly operation of the fire department or with the intention of misleading any fire department personnel.

1-15 Tampering With Fire Safety Equipment.

1-15.1 No person shall render any portable or fixed fire-extinguishing system or device or any fire warning system inoperative or inaccessible.

Exception: As necessary during emergencies, maintenance, drills, prescribed testing, alterations, or renovations.

1-15.2 No person shall render a system or device inoperative during an emergency unless by direction of the incident commander.

1-15.3 No person, except a person authorized by the authority having jurisdiction, shall remove, unlock, destroy, or tamper with in any manner any locked gate, door, or barricade; chain; enclosure; sign; tag; or seal that has been required by the authority having jurisdiction pursuant to this Code.

1-16 Permits and Approvals.

1-16.1 The authority having jurisdiction shall be authorized to establish and issue permits, certificates, notices, and approvals, or orders pertaining to fire control and fire hazards pursuant to this section.

1-16.2 The authority having jurisdiction shall be permitted to revoke a permit or approval issued if any violation of this Code is found upon inspection or in case there have been any false statements or misrepresentations submitted in the application or plans on which the permit or approval was based.

1-16.3 Any attempt to defraud or otherwise deliberately or knowingly design, install, service, maintain, operate, sell, represent for sale, falsify records, reports, or applications, or other related activity in violation of the requirements prescribed by this Code shall be a violation of this Code. Such violations shall be cause for immediate suspension or revocation of any related licenses, certificates, or permits issued by this

jurisdiction. In addition, any such violation shall be subject to any other criminal or civil penalties as available by the laws of this jurisdiction.

1-16.4 Revocation shall be constituted when the permittee is duly notified by the authority having jurisdiction.

1-16.5 Any person who engages in any business, operation, or occupation, or uses any premises, after the fire permit issued therefore has been suspended or revoked pursuant to the provisions of this Code, and before such suspended permit has been reinstated or a new permit issued, shall be in violation of this Code.

1-16.6 A permit shall be predicated upon compliance with the requirements of this Code and shall constitute written authority issued by the authority having jurisdiction to maintain, store, use, or handle materials, or to conduct processes that could produce conditions hazardous to life or property, or to install equipment used in connection with such activities. Any permit issued under this Code shall not take the place of any other license or permit required by other regulations or laws of this jurisdiction.

1-16.7 The authority having jurisdiction shall have the authority to require an inspection prior to the issuance of a permit.

1-16.8 A permit issued under this Code shall continue until revoked or for the period of time designated on the permit. The permit shall be issued to one person or business only and for the location or purpose described in the permit. Any change that affects any of the conditions of the permit shall require a new or amended permit.

1-16.9 The authority having jurisdiction shall have the authority to grant an extension of the permit time period upon presentation by the permittee of a satisfactory reason for failure to start or complete the work or activity authorized by the permit.

1-16.10 Applications for permits shall be made to the authority having jurisdiction on forms provided by the jurisdiction and shall include the applicant's answers in full to inquiries set forth on such forms. Applications for permits shall be accompanied by such data as required by the authority having jurisdiction and fees as required by the jurisdiction.

1-16.11 The authority having jurisdiction shall review all applications submitted and issue permits as required. If an application for a permit is rejected by the authority having jurisdiction, the applicant shall be advised of the reasons for such rejection. Permits for activities requiring evidence of financial responsibility by the jurisdiction shall not be issued unless proof of required financial responsibility is furnished.

1-16.12 A copy of the permit shall be posted or otherwise readily accessible at each place of operation or carried by the permit holder as specified by the authority having jurisdiction.

1-16.13 Any activity authorized by any permit issued under this Code shall be conducted by the permittee or the permittee's agents or employees in compliance with all requirements of this Code applicable thereto and in accordance with the approved plans and specifications. No permit issued under this Code shall be interpreted to justify a violation of any provision of this Code or any other applicable law or regulation. Any addition or alteration of approved plans or specifications shall be approved in advance by the authority having jurisdiction, as evidenced by the issuance of a new or amended permit.

1-16.14* Permits shall be issued by the authority having jurisdiction and shall bear the name and signature of the authority having jurisdiction or that of the authority having jurisdiction's designated representative. In addition, the permit shall indicate the following:

- (1) Operation or activities for which the permit is issued
- (2) Address or location where the operation or activity is to be conducted
- (3) Name and address of the permittee
- (4) Permit number and date of issuance
- (5) Period of validity of the permit
- (6) Inspection requirements

1-16.15 Any application for, or acceptance of, any permit requested or issued pursuant to this Code shall constitute agreement and consent by the person making the application or accepting the permit to allow the authority having jurisdiction to enter the premises at any reasonable time to conduct such inspections as required by this Code.

1-16.16 The authority having jurisdiction shall have the authority to issue permits for the following operations within the jurisdiction:

- (1) *Amusement Parks.* Construction, alteration, or operation of amusement park fire protection safety features.
- (2) *Automatic Fire Suppression Systems.* Installation of or modification to any automatic fire suppression system. Maintenance performed in accordance with this Code is not considered a modification and does not require a permit.
- (3) *Bonfires and Outdoor Rubbish Fires.* Kindling or maintaining any open fire or a fire in any public street, alley, road, or other public or private ground. Instructions and stipulations of permit shall be adhered to. Cooking fires are exempt and do not require a permit.
- (4) *Bowling Lanes.* Refinishing and resurfacing of bowling lanes and bowling pin refinishing.
- (5) *Calcium Carbide.* Storage in cylinders or containers.
- (6) *Cellulose Nitrate Film.* Storage, handling, or use of cellulose nitrate film.
- (7) *Combustible Fibers.* Storage or handling of combustible fibers covered by Section 12-2 of this Code.
- (8) *Compressed Gases.* Storage, handling, or use of compressed gases. Installation or modification of any compressed gas system.
- (9) *Covered Mall Buildings.* Permit required annually for facilities that utilize the mall area for exhibits or displays. Exhibits and displays include community service projects, sidewalk sales, and holiday sales. Other trade shows and exhibits held in the mall shall require a separate trade show/exhibit permit.
- (10) *Cutting and Welding.* Cutting or welding operations within the jurisdiction.
- (11) *Dust Explosion Prevention.* Installation, modification, or operation of the following:
 - a. Grain bleacher or elevator
 - b. Starch, flour, or feed mill
 - c. Malt house
 - d. Wood flour manufacturing plant
 - e. Aluminum, coal, cocoa, magnesium, spices, sugar, or other facility that pulverizes materials subject to dust explosion
 - f. Any central dust collection system
 - g. Any equipment that produces significant amounts of dust subject to explosion

- (12) *Exhibit and Trade Shows*. Operation of all exhibits and trade shows held within the jurisdiction.
- (13) *Explosives*. Manufacture, sell, dispose, purchase, storage, use, possess, or transport of explosives within the jurisdiction. A separate permit, valid for no more than 90 days, shall be required to conduct blasting operations.
- (14) *Fire Alarm and Detection Systems and Related Equipment*. Installation of or modification to fire alarm and detection systems and related equipment. Maintenance performed in accordance with this Code is not considered a modification and does not require a permit.
- (15) *Fire Pumps and Related Equipment*. Installation of or modification to fire pumps and related fuel tanks, jockey pumps, controllers, and generators. Maintenance performed in accordance with this Code is not considered a modification and does not require a permit.
- (16) *Fireworks*. Possession, storage, manufacture, sale, or discharge of fireworks within the jurisdiction.
- (17) *Flammable and Combustible Liquids*.
 - a. Storage, use, handling, or transportation of Class I, Class II, or Class IIIA flammable or combustible liquids
 - b. Installation, modification, removal, abandonment, defueling, or slurry fill of storage tanks
 - c. Manufacture, processing, blending, or refining
 - d. Operation of cargo tankers that transport flammable and combustible liquids
- (18) *Flammable Finish Application*. The spray application of flammable or combustible liquids. Installation or modification of any spray room or booth.
- (19) *Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures*. Construction, location, erection or placement of grandstands and bleachers, folding and telescopic seating, tents, and membrane structures.
- (20) *Industrial Ovens and Furnaces*. Operation of industrial ovens and furnaces covered by Chapter 19.
- (21) *LP-Gas*.
 - a. Storage and use of LP-Gas
 - b. Installation of or modification to any LP-Gas system
 - c. Operation of any cargo tankers that transport LP-Gas
- (22) *Lumber Yards and Woodworking Plants*. Storage of lumber exceeding 100,000 board ft.
- (23) *Magnesium*. Storage, handling, or processing of magnesium in quantities deemed significant by the authority having jurisdiction.
- (24) *Organic Coatings*. Operation and maintenance of a facility that manufactures organic coatings.
- (25) *Outdoor Storage of Scrap Tires*. Establish, conduct, or maintain any outdoor storage of scrap tires that exceeds 2500 ft³ (18.7 m³) of total volume of scrap tires.
- (26) *Oxidizers and Organic Peroxides, Storage of, Regulated by Chapter 24*.
 - a. Materials classified as having more than one hazard category if the quantity limits are exceeded in any category
 - b. Repair, abandonment, removal, placing temporarily out-of-service, closing, or substantial modification a storage facility
 - c. Installation, modification, alteration, or addition to any stationary aboveground or underground hazardous materials storage tank, secondary containment system, ventilation system, exhaust treatment system, explosion venting or suppression systems, or gas detection systems
 - d. Storage, handling, or use of chlorine
 - e. Installation or modification to any chlorine gas system
- (27) *Pesticides and Herbicides, Storage of*.
- (28) *Pyroxylin Plastics*. Storage, handling, assembly, or manufacture of pyroxylin plastics.
- (29) *Private Fire Hydrants*. Installation, modification, or removal from service of any private fire hydrants.
- (30) *Repair Garages and Service Stations*. Operation of repair garages and service stations.
- (31) *Roof-Top Heliports*. Construction, modification, or operation of a roof-top heliport.
- (32) *Tire Rebuilding Plants*. Operation and maintenance of a tire rebuilding plant.
- (33) *Standpipe Systems*. Installation, modification, or removal from service of any standpipe system. Maintenance performed in accordance with this Code is not considered a modification and does not require a permit.
- (34) *Special Outdoor Events, Carnivals, and Fairs*. The location and operation of special outdoor events, carnivals, and fairs.
- (35) *Tar Kettles*. Permit shall be obtained at least two working days prior to the placement of a tar kettle.
- (36) *Torch-Applied Roofing Systems, Installation of*.

1-17 Certificates of Fitness.

1-17.1 The authority having jurisdiction shall have the authority to require certificates of fitness for individuals or companies performing activities related to fire safety within the jurisdiction such as the following:

- (1) Use of explosive materials
- (2) Blasting or demolition operations
- (3) Fireworks displays
- (4) Inspection, servicing, or recharging of portable fire extinguishers
- (5) Servicing or recharging of fixed fire extinguishing systems
- (6) Servicing of fire alarm or fire communication systems
- (7) Servicing of gas- or oil-burning heating systems
- (8) Chimney sweep operations
- (9) Inspection or servicing of range-hood systems
- (10) Installation or servicing of chlorine systems

1-17.2 Where certificates of fitness are required, the authority having jurisdiction shall be responsible for their issuance.

1-17.3 The authority having jurisdiction shall be permitted to revoke a certificate of fitness issued if any violation of this Code is found upon inspection or where there have been any false statements or misrepresentations submitted in the application on which the approval was based.

1-17.4 Revocation shall be constituted when the certificate holder is duly notified by the authority having jurisdiction.

1-17.5 All applications for a certificate of fitness shall be filed with the authority having jurisdiction on forms provided by the authority having jurisdiction.

1-17.6 Every person applying for a certificate of fitness shall furnish evidence to the authority having jurisdiction of familiarity with the codes and standards for which the certificate of fitness is issued.

1-17.7 The authority having jurisdiction shall investigate every application for a certificate of fitness. The investigation shall include an examination of the applicant's experience and training in the field of the certificate of fitness for which application has been made.

1-17.8 When the authority having jurisdiction determines that an applicant is not fit to receive the certificate of fitness because of the applicant's inability to comply with the provisions of this Code, the authority having jurisdiction shall refuse to issue the certificate of fitness. If the refusal is based on the applicant's inability to pass an examination given to determine competency, the applicant shall not be permitted to apply again for the certificate of fitness within a 10-day period following the examination.

1-17.9 Certificates of fitness shall not be transferable.

1-17.10 Certificates of fitness shall be issued for the period of time as indicated on the certificate of fitness as determined by the authority having jurisdiction, but such period of time shall not exceed three years.

1-17.11 Applications for renewal of a certificate of fitness shall be filed in the same manner as an application for an original certificate.

1-17.12 Each person holding a certificate of fitness shall notify the authority having jurisdiction in writing of any address change within 10 days after such change. Failure on the part of a person to give such notification shall constitute grounds for revocation of the certificate of fitness.

1-17.13 A certificate of fitness shall be in the form of an identification card. The card shall contain the following information:

- (1) Purpose for which the certificate of fitness is issued
- (2) Date of expiration
- (3) Information necessary to properly identify the person to whom the certificate of fitness is issued
- (4) Signature of the person to whom the certificate of fitness is issued
- (5) Name and signature of the authority having jurisdiction or a designated representative
- (6) Printed thereon in bold type the following:

THIS CERTIFICATE IS NOT AN ENDORSEMENT OF THIS PERSON BY THE AUTHORITY HAVING JURISDICTION

1-17.14 Any person to whom a certificate of fitness has been granted shall, upon request, produce and show proper identification and the certificate of fitness to anyone for whom that person seeks to render services or to the authority having jurisdiction.

1-18 Plans Review.

1-18.1 Where required by the authority having jurisdiction for new construction, modification, or rehabilitation, construction documents and shop drawings shall be submitted and reviewed as provided in this section.

1-18.2 It shall be the responsibility of the applicant to ensure that the following conditions are met:

- (1) The construction documents include all of the fire protection requirements.
- (2) The shop drawings are correct and in compliance with the applicable codes and standards.

1-18.3 It shall be the responsibility of the authority having jurisdiction to promulgate rules that cover the following:

- (1) Criteria to meet the requirements of Section 1-18
- (2) Review of documents and shop drawings within established time frames for the purpose of acceptance or providing reasons for nonacceptance

1-18.4 Review and approval by the authority having jurisdiction shall not relieve the applicant of the responsibility of compliance with this Code.

1-18.5 When required by the authority having jurisdiction, revised construction documents or shop drawings shall be prepared and submitted for review and approval to illustrate corrections or modifications necessitated by field conditions or other revisions to approved plans.

1-18.6* Independent Review. The authority having jurisdiction shall be permitted to require a review by a mutually acceptable independent third party with expertise in the matter to be reviewed at the submitter's expense. The independent reviewer shall provide an evaluation and recommend necessary changes of the proposed design, operation, process, or new technology to the authority having jurisdiction.

1-19 Notice of Violations and Penalties.

1-19.1 Whenever the authority having jurisdiction determines violations of this Code, a written notice shall be issued to confirm such findings.

1-19.2 Any order or notice issued pursuant to this Code shall be served upon the owner, operator, occupant, or other person responsible for the condition or violation, either by personal service, by mail, or by delivering the same to, and leaving it with, some person of responsibility upon the premises. For unattended or abandoned locations, a copy of such order or notice shall be posted on the premises in a conspicuous place at or near the entrance to such premises and the order or notice shall be mailed by registered or certified mail, with return receipt requested, to the last known address of the owner, occupant, or both.

1-19.3 Any person who fails to comply with the provisions of this Code or who fails to carry out an order made pursuant of this Code or violates any condition attached to a permit, approval, or certificate shall be subject to the penalties established by this jurisdiction.

1-19.4 Failure to comply with the time limits of an abatement notice or other corrective notice issued by the authority having jurisdiction shall result in each day that such violation continues being regarded as a new and separate offense.

1-20 Units.

1-20.1 SI Units. Metric units of measurement in this Code are in accordance with the modernized metric system known as the International System of Units (SI). (*101:1-6.1*)

1-20.2 Primary and Equivalent Values. If a value for a measurement as given in this Code is followed by an equivalent value in other units, the first stated value shall be regarded as the requirement. A given equivalent value might be approximate. (*101:1-6.2*)

Chapter 2 Definitions

2-1 Definitions. Words defined in this Code are intended only for use with sections of this Code. Definitions set forth in any document referenced by this Code shall be the acceptable definition for use of that document only. Where terms are not defined, they shall have their ordinary accepted meanings within the context with which they are used. Webster's *Third New International Dictionary of the English Language*, Unabridged, shall be considered as providing ordinary accepted meaning.

2-1.1 Aboveground Storage Tank. A horizontal or vertical tank that is listed and intended for fixed installation, without backfill, above or below grade, and is used within the scope of its approval or listing. (30A:1-2)

2-1.2 Access Box. A container of a type approved by the authority having jurisdiction installed in an accessible location for the purpose of containing keys or other devices to gain necessary access to areas of the premises.

2-1.3 Addition. An extension or increase in the floor area or height of a building or structure. (101:3.3.3)

2-1.4 Airport Ramp. Any outdoor area, including aprons and hardstands, where aircraft can be positioned, stored, serviced, or maintained, irrespective of the nature of the surface of the area. (415:1-4)

2-1.5* Airport Terminal Building. A structure used primarily for air passenger enplaning or deplaning, including ticket sales, flight information, baggage handling, and other necessary functions in connection with air transport operations. This term includes any extensions and satellite buildings used for passenger handling or aircraft flight service functions. Aircraft loading walkways and "mobile lounges" are excluded. (415:1-4)

2-1.6 Alternative. A system, condition, arrangement, material, or equipment submitted to the authority having jurisdiction as a substitute for a code requirement.

2-1.7 Ambulatory Health Care Occupancy. A building or portion thereof used to provide services or treatment simultaneously to four or more patients that (1) provides, on an outpatient basis, treatment for patients that renders the patients incapable of taking action for self-preservation under emergency conditions without the assistance of others; or (2) provides, on an outpatient basis, anesthesia that renders the patients incapable of taking action for self-preservation under emergency conditions without the assistance of others. (101:3.3.134.1)

2-1.8 ANSI/ASME. An American National Standards Institute publication, sponsored and published by the American Society of Mechanical Engineers.

2-1.9* Apartment Building. A building containing three or more dwelling units with independent cooking and bathroom facilities. (101:3.3.25.1)

2-1.10* Approved. Acceptable to the authority having jurisdiction.

2-1.11 ASME. American Society of Mechanical Engineers.

2-1.12 ASME Container (or Tank). A container constructed in accordance with the ASME Code. (See *Appendix D of NFPA 58*.) (58:1-6)

2-1.13* Assembly Occupancy. An occupancy (1) used for a gathering of 50 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting trans-

portation, or similar uses; or (2) used as a special amusement building, regardless of occupant load. (101:3.3.134.2)

2-1.14* Authority Having Jurisdiction. The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

2-1.15 Automatic Fire Extinguishing System. Any system designed and installed to detect a fire and subsequently discharge an extinguishing agent without the necessity of human intervention.

2-1.16 Basement. Any story that has more than 50 percent of the total area of the building's perimeter below grade.

2-1.17 Board of Appeals. A group of persons appointed by the governing body of the jurisdiction adopting this code for the purpose of hearing and adjudicating differences of opinion between the authority having jurisdiction and the citizenry in the interpretation, application, and enforcement of this Code.

2-1.18* Building. Any structure used or intended for supporting or sheltering any use or occupancy. (101:3.3.25)

2-1.18.1* Building, Existing. A building erected or officially authorized prior to the effective date of the adoption of this edition of the Code by the agency or jurisdiction. (101:3.3.25.4)

2-1.19 Bulk Merchandising Retail Building. A building in which the sales area includes the storage of combustible materials on pallets, in solid piles, or in racks in excess of 12 ft (3.7 m) in storage height. (101:3.3.25.2)

2-1.20* Business Occupancy. An occupancy used for account and record keeping or the transaction of business other than mercantile. (101:3.3.134.3)

2-1.21 Certificate of Fitness. A written document issued by authority of the authority having jurisdiction to any person for the purpose of granting permission to such person to conduct or engage in any operation or act for which certification is required.

2-1.22 CFR. The Code of Federal Regulations of the United States Government.

2-1.23 Class A Fires. Fires in ordinary combustible materials, such as wood, cloth, paper, rubber, and many plastics. (10:1-3)

2-1.24 Class B Fires. Fires in flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammable gases. (10:1-3)

2-1.25 Class C Fires. Fires that involve energized electrical equipment where the electrical nonconductivity of the extinguishing media is of importance. (When electrical equipment is de-energized, fire extinguishers for Class A or Class B fires can be used safely.) (10:1-3)

2-1.26 Class D Fires. Fires in combustible metals, such as magnesium, titanium, zirconium, sodium, lithium, and potassium. (10:1-3)

2-1.27 Class K Fires. Fires in cooking appliances that involve combustible cooking media (vegetable or animal oils and fats). (10:1-3)

2-1.28 Classification of Hazards for Portable Fire Extinguishers.

2-1.28.1 Extra (High) Hazard. Extra hazard occupancies are locations where the total amount of Class A combustibles and Class B flammables present, in storage, production, use, finished product, or combination thereof, is over and above those expected in occupancies classed as ordinary (moderate)

hazard. These occupancies could consist of woodworking, vehicle repair, aircraft and boat servicing, cooking areas, individual product display showrooms, product convention center displays, and storage and manufacturing processes such as painting, dipping, and coating, including flammable liquid handling. Also included is warehousing of or in-process storage of other than Class I and Class II commodities as defined by NFPA 13, *Standard for the Installation of Sprinkler Systems*. (10:1-5.3)

2-1.28.2 Light (Low) Hazard. Light hazard occupancies are locations where the total amount of Class A combustible materials, including furnishings, decorations, and contents, is of minor quantity. This can include some buildings or rooms occupied as offices, classrooms, churches, assembly halls, guest room areas of hotels/motels, and so forth. This classification anticipates that the majority of content items are either noncombustible or so arranged that a fire is not likely to spread rapidly. Small amounts of Class B flammables used for duplicating machines, art departments, and so forth, are included, provided that they are kept in closed containers and safely stored. (10:1-5.1)

2-1.28.3 Ordinary (Moderate) Hazard. Ordinary hazard occupancies are locations where the total amount of Class A combustibles and Class B flammables are present in greater amounts than expected under light (low) hazard occupancies. These occupancies could consist of dining areas, mercantile shops, and allied storage; light manufacturing, research operations, auto showrooms, parking garages, workshop or support service areas of light (low) hazard occupancies; and warehouses containing Class I or Class II commodities as defined by NFPA 13, *Standard for the Installation of Sprinkler Systems*. (10:1-5.2)

2-1.29 Clean Zone. A defined space in which the concentration of airborne particles is controlled to specified limits. (318:1-4)

2-1.30 Cleanroom. A room in which the concentration of airborne particles is controlled to specified limits. Cleanrooms include areas below the raised floor and above the ceiling grid if these areas are part of the air path and within the rated construction. (318:1-4)

2-1.31 Closed Container. A container as herein defined, so sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ordinary temperatures. (30A:1-2)

2-1.32* Code. A standard that is an extensive compilation of provisions covering broad subject matter or that is suitable for adoption into law independently of other codes and standards.

2-1.33 Combustible. A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible. (101:3.3.29)

2-1.34* Combustible Dust. Any finely divided solid material 420 microns or smaller in diameter (material passing a U.S. No. 40 standard sieve) that presents a fire hazard or a deflagration hazard when dispersed and ignited in air. (650:1-5)

2-1.35 Combustible Fiber. Any material in a fibrous or shredded form that will readily ignite when heat sources are present.

2-1.36* Combustible Particulate Solid. Any combustible solid material comprised of distinct particles or pieces, regardless of size, shape, or chemical composition that generates combustible dusts during handling. Combustible particulate solids include dusts, fibers, fines, chips, chunks, flakes, or mixtures of these. (650:1-5)

2-1.37 Combustible Refuse. All combustible or loose rubbish, litter, or waste materials generated by an occupancy that are refused, rejected, or considered worthless and are disposed of by incineration on the premises where generated or periodically transported from the premises.

2-1.38 Combustible Waste. Combustible or loose waste materials that are generated by an establishment or process and, being salvageable, are retained for scrap or reprocessing on the premises where generated or transported to a plant for processing. These include, but are not limited to, all combustible fibers, hay, straw, hair, feathers, down, wood shavings, turnings, all types of paper products, soiled cloth trimmings and cuttings, rubber trimmings and buffings, metal fines, and any mixture of the above items, or any other salvageable combustible waste materials.

2-1.39 Combustion. A chemical process that involves oxidation sufficient to produce light or heat. (101:3.3.30)

2-1.40* Common Path of Travel. The portion of exit access that must be traversed before two separate and distinct paths of travel to two exits are available. (101:3.3.32)

2-1.41 Construction Documents. Documents that consist of scaled design drawings and specifications for the purpose of construction of new facilities or modification to existing facilities. (See also 2-1.141, *Shop Drawings*.)

2-1.42* Consumer Fireworks. (Formerly known as Common Fireworks) Any small fireworks device designed primarily to produce visible effects by combustion that complies with the construction, chemical composition, and labeling regulations of the U.S. Consumer Product Safety Commission, as set forth in Title 16, *CFR*, Parts 1500 and 1507. Some small devices designed to produce audible effects are included, such as whistling devices, ground devices containing 0.8 grains (50 mg) or less of explosive composition (salute powder), and aerial devices containing 2 grains (130 mg) or less of explosive composition (salute powder) per explosive unit. (1124:1-4)

2-1.43 Container.

2-1.43.1 Container, Flammable or Combustible Liquid. Any vessel of 60 U.S. gal (227 L) or less capacity used for transporting or storing liquids. (30:1-6)

2-1.43.2 Container, LP-Gas. Any vessel, including cylinders, tanks, portable tanks, and cargo tanks, used for the transporting or storing of LP-Gases. (58:1-6)

2-1.44 Cylinder. A container constructed in accordance with U.S. Department of Transportation specifications (Title 49, *Code of Federal Regulations*). (58:1-6)

2-1.45* Day-Care Home. A building or portion of a building in which more than three but not more than 12 clients receive care, maintenance, and supervision, by other than their relative(s) or legal guardians(s), for less than 24 hours per day. (101:3.3.39)

2-1.46* Day-Care Occupancy. An occupancy in which four or more clients receive care, maintenance, and supervision, by other than their relatives or legal guardians, for less than 24 hours per day. (101:3.3.134.4)

2-1.47 Dedicated Smoke Control Systems. Systems that are intended for the purpose of smoke control only. They are separate systems of air moving and distribution equipment that do not function under normal building operating conditions. Upon activation, these systems operate specifically to perform the smoke control function.

2-1.48 Deflagration. Propagation of a combustion zone at a velocity that is less than the speed of sound in the unreacted medium. (68:1-4)

2-1.49 Detached Storage. Storage in a separate building or in an outside area located away from all structures.

2-1.50 Detectors.

2-1.50.1 Air Sampling-Type Detector. A detector that consists of a piping or tubing distribution network that runs from the detector to the area(s) to be protected. An aspiration fan in the detector housing draws air from the protected area back to the detector through air sampling ports, piping, or tubing. At the detector, the air is analyzed for fire products. (72:1-4)

2-1.50.2 Line-Type Detector. A device in which detection is continuous along a path. Typical examples are rate-of-rise pneumatic tubing detectors, projected beam smoke detectors, and heat-sensitive cable. (72:1-4)

2-1.50.3 Spot-Type Detector. A device in which the detecting element is concentrated at a particular location. Typical examples are bimetallic detectors, fusible alloy detectors, certain pneumatic rate-of-rise detectors, certain smoke detectors, and thermoelectric detectors. (72:1-4)

2-1.51* Detention and Correctional Occupancy. An occupancy used to house four or more persons under varied degrees of restraint or security where such occupants are mostly incapable of self-preservation because of security measures not under the occupants' control. (101:3.3.134.5)

2-1.51.1 Detention and Correctional Use Condition. For application of the life safety requirements of this chapter, the resident user category shall be divided into the following five groups.

(a) *Use Condition I — Free Egress.* Free movement is allowed from sleeping areas and other spaces where access or occupancy is permitted to the exterior via means of egress that meet the requirements of the Code.

(b) *Use Condition II — Zoned Egress.* Free movement is allowed from sleeping areas and any other occupied smoke compartment to one or more other smoke compartments.

(c) *Use Condition III — Zoned Impeded Egress.* Free movement is allowed within individual smoke compartments, such as within a residential unit comprised of individual sleeping rooms and a group activity space, with egress impeded by remote-controlled release of means of egress from such a smoke compartment to another smoke compartment.

(d) *Use Condition IV — Impeded Egress.* Free movement is restricted from an occupied space. Remote-controlled release is provided to allow movement from all sleeping rooms, activity spaces, and other occupied areas within the smoke compartment to another smoke compartment.

(e) *Use Condition V — Contained.* Free movement is restricted from an occupied space. Staff-controlled manual release at each door is provided to allow movement from all sleeping rooms, activity spaces, and other occupied areas within the smoke compartment to another smoke compartment. (101:22.1.4.1, 101:23.1.4.1)

2-1.52 Detonation. Propagation of a combustion zone at a velocity that is greater than the speed of sound in the unreacted medium. (68:1-4)

2-1.53* Dormitory. A building or a space in a building in which group sleeping accommodations are provided for more than 16 persons who are not members of the same family in one room or a series of closely associated rooms under joint

occupancy and single management, with or without meals, but without individual cooking facilities. (101:3.3.46)

2-1.54 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. (101:3.3.48)

2-1.55* Educational Occupancy. An occupancy used for educational purposes through the twelfth grade by six or more persons for four or more hours per day or more than 12 hours per week. (101:3.3.134.6)

2-1.56 Emergency. A fire, explosion, or hazardous condition that poses an immediate threat to the safety of life or damage to property.

2-1.57* Existing. That which is already in existence on the date this edition of the Code goes into effect. (101:3.3.59)

2-1.58 Existing Condition. Any situation, circumstance, or physical makeup of any structure, premise, or process that was ongoing or in effect prior to the adoption of this Code. (1141:2-1)

2-1.59* Exit. That portion of a means of egress that is separated from all other spaces of a building or structure by construction or equipment as required to provide a protected way of travel to the exit discharge. (101:3.3.61)

2-1.60 Exit Access. That portion of a means of egress that leads to an exit. (101:3.3.62)

2-1.61 Exit Discharge. That portion of a means of egress between the termination of an exit and a public way. (101:3.3.63)

2-1.62 Explosion. The bursting or rupturing of an enclosure or a container due to the development of internal pressure from a deflagration. (68:1-4)

2-1.63* Fire Compartment. A space within a building that is enclosed by fire barriers on all sides, including the top and bottom. (101:3.3.71)

2-1.64 Fire Door Assembly. Any combination of a fire door, a frame, hardware, and other accessories that together provide a specific degree of fire protection to the opening. (80:1-4)

2-1.65 Fire Hazard. Any situation, process, material, or condition that, on the basis of applicable data, can cause a fire or explosion or provide a ready fuel supply to augment the spread or intensity of the fire or explosion and that poses a threat to life or property.

2-1.66* Fire Hydrant. A connection to a water main for the purpose of supplying water to fire hose or other fire protection apparatus.

2-1.67 Fire Lane. The road or other means developed to allow access and operational setup for fire-fighting and rescue apparatus.

2-1.68 Fire Protection System. Any fire alarm device or system or fire extinguishing device or system, or their combination, that is designed and installed for detecting, controlling, or extinguishing a fire or otherwise alerting occupants, or the fire department, or both, that a fire has occurred. (1141:2-1)

2-1.69 Fire Retardants. Liquids, solids, or gases that tend to inhibit combustion when applied on, mixed in, or combined with combustible materials.

2-1.70 Fire Watch. The assignment of a person or persons to an area for the express purpose of notifying the fire department and/or building occupants of an emergency, preventing

a fire from occurring, extinguishing small fires, or protecting the public from fire or life safety dangers.

2-1.71 Flame Spread. The propagation of flame over a surface. (101:3.3.78)

2-1.72 Flame Spread Rating. The comparative performance of fire travel over the surface of a material when tested in accordance with the provisions of NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*.

2-1.73* Floor Area, Gross. The floor area within the inside perimeter of the outside walls of the building under consideration with no deduction for hallways, stairs, closets, thickness of interior walls, columns, or other features. (101:3.3.81)

2-1.74 Floor Area, Net. The floor area that is the actual occupied area, not including accessory unoccupied areas or thickness of walls. (101:3.3.82)

2-1.75 Gallon. One U.S. standard gallon (3.8 L).

2-1.76 Ground Kettle. A container that might or might not be mounted on wheels and is used for heating tar, asphalt, or similar substances.

2-1.77 Hazard of Contents.

2-1.77.1* High Hazard. High hazard contents shall be classified as those that are likely to burn with extreme rapidity or from which explosions are likely. (*For means of egress requirements, see Section 7.11 of NFPA 101.*) (101:6.2.2.4)

2-1.77.2* Low Hazard. Low hazard contents shall be classified as those of such low combustibility that no self-propagating fire therein can occur. (101:6.2.2.2)

2-1.77.3* Ordinary Hazard. Ordinary hazard contents shall be classified as those that are likely to burn with moderate rapidity or to give off a considerable volume of smoke. (101:6.2.2.3)

2-1.78* Health Care Occupancy. An occupancy used for purposes of medical or other treatment or care of four or more persons where such occupants are mostly incapable of self-preservation due to age, physical or mental disability, or because of security measures not under the occupants' control. (101:3.3.134.7)

2-1.79 Highly Volatile Liquid. A liquid with a boiling point of less than 68°F (20°C).

2-1.80* High-Rise Building. A building greater than 75 ft (23 m) in height where the building height is measured from the lowest level of fire department vehicle access to the floor of the highest occupiable story. (101:3.3.25.6)

2-1.81* Horizontal Exit. A way of passage from one building to an area of refuge in another building on approximately the same level, or a way of passage through or around a fire barrier to an area of refuge on approximately the same level in the same building that affords safety from fire and smoke originating from the area of incidence and areas communicating therewith. (101:3.3.61.1)

2-1.82 Hospital. A building or portion thereof used on a 24-hour basis for the medical, psychiatric, obstetrical, or surgical care of four or more inpatients. (101:3.3.104)

2-1.83* Hotel. A building or groups of buildings under the same management in which there are sleeping accommodations for more than 16 persons and primarily used by transients for lodging with or without meals. (101:3.3.105)

2-1.84 Imminent Danger. Any conditions or practices in any occupancy or structure that pose a danger that could reasonably

be expected to cause death, serious physical harm, or serious property loss.

2-1.85 Incident Commander (IC). The fire department individual in overall command of an emergency incident. (1561:1-3)

2-1.86 Indicating Valve. A valve that has components that show if the valve is open or closed. Examples are outside screw and yoke (OS&Y) gate valves and underground gate valves with indicator posts.

2-1.87* Industrial Occupancy. An occupancy in which products are manufactured or in which processing, assembling, mixing, packaging, finishing, decorating, or repair operations are conducted. (101:3.3.134.8)

2-1.88 Initiating Device Circuit. A circuit to which automatic or manual initiating devices are connected where the signal received does not identify the individual device operated. (72:1-4)

2-1.89 Isolated Storage. Storage in a different storage room or in a separate and detached building located at a safe distance.

2-1.90 Jurisdiction. Any governmental unit or political division or subdivision, including, but not limited to township, city, village, county, borough, state, commonwealth, province, freehold, district, or territory, that has adopted this Code under due legislative authority.

2-1.91 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

2-1.92* Limited Care Facility. A building or portion of a building used on a 24-hour basis for the housing of four or more persons who are incapable of self-preservation because of age; physical limitations due to accident or illness; or limitations such as mental retardation/developmental disability, mental illness, or chemical dependency. (101:3.3.117)

2-1.93* Liquefied Natural Gas (LNG). A fluid in the liquid state that is composed predominantly of methane and that can contain minor quantities of ethane, propane, nitrogen, or other components normally found in natural gas. (57:1-6)

2-1.94 Liquefied Petroleum Gas (LP-Gas). Any material having a vapor pressure not exceeding that allowed for commercial propane composed predominantly of the following hydrocarbons, either by themselves or as mixtures: propane, propylene, butane (normal butane or isobutane), and butylenes. (58:1-6)

2-1.95* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

2-1.96 Lodging or Rooming House. A building or portion thereof that does not qualify as a one- or two-family dwelling, that provides sleeping accommodations for a total of 16 or fewer people on a transient or permanent basis, without per-

sonal care services, with or without meals, but without separate cooking facilities for individual occupants. (101:3.3.120)

2-1.97 Loose House. A separate detached building in which unbalanced combustible fibers are stored.

2-1.98 Marine Vessel. Every description of water craft or other artificial contrivance used as a means of transportation in or on the water.

2-1.99 Material, Compatible. A material that, when in contact with an oxidizer, will not react with the oxidizer or promote or initiate its decomposition. (430:1-5.10)

2-1.100 Material, Incompatible. A material that, when in contact with an oxidizer, can cause hazardous reactions or can promote or initiate decomposition of the oxidizer. (430:1-5.11)

2-1.101* Means of Egress. A continuous and unobstructed way of travel from any point in a building or structure to a public way consisting of three separate and distinct parts: (1) the exit access, (2) the exit, and (3) the exit discharge. (101:3.3.121)

2-1.102 Means of Escape. A way out of a building or structure that does not conform to the strict definition of *means of egress* but does provide an alternate way out. (101:3.3.122)

2-1.103* Mercantile Occupancy. An occupancy used for the display and sale of merchandise. (101:3.3.134.9)

2-1.103.1 Subclassification of Mercantile Occupancy. Mercantile occupancies shall be subclassified as follows.

(a) *Class A.* All mercantile occupancies having an aggregate gross area of more than 30,000 ft² (2800 m²) or using more than three levels, excluding mezzanines, for sales purposes.

(b) *Class B.* All mercantile occupancies of more than 3000 ft² (280 m²) but not more than 30,000 ft² (2800 m²) aggregate gross area, or using floors above or below the street floor level for sales purposes (mezzanines permitted).

Exception: If more than three floors, excluding mezzanines, are used, the mercantile occupancy shall be Class A, regardless of area.

(c) *Class C.* All mercantile occupancies of not more than 3000 ft² (280 m²) gross area used for sales purposes on one story only, excluding mezzanines. (101:36.1.4.2.1 and 101:37.1.4.2.1)

2-1.104 Mezzanine. An intermediate level between the floor and the ceiling of any room or space. (101:3.3.126)

2-1.105 Noncombustible Material. A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. Materials that are reported as passing ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, shall be considered noncombustible materials. (102:2-2)

2-1.106 Nondedicated Smoke Control Systems. Systems that share components with some other system(s) such as the building HVAC system. Activation causes the system to change its mode of operation to achieve the smoke control objective.

2-1.107 Nonflammable Gas. A class of gases that is nonflammable, generally nonreactive.

2-1.108 Nursing Home. A building or portion of a building used on a 24-hour basis for the housing and nursing care of four or more persons who, because of mental or physical incapacity, might be unable to provide for their own needs and safety without the assistance of another person. (101:3.3.132)

2-1.109 Occupancy. The purpose for which a building or portion thereof is used or intended to be used. (101:3.3.134)

2-1.110 Occupant Load. The total number of persons that might occupy a building or portion thereof at any one time. (101:3.3.136)

2-1.111* Occupiable Story. A story occupied by people on a regular basis. (101:3.3.194.1)

2-1.112 One- and Two-Family Dwelling. One- and two-family dwellings include buildings containing not more than two dwelling units in which each dwelling unit is occupied by members of a single family with not more than three outsiders, if any, accommodated in rented rooms. (101:24-1.1.1)

2-1.113 Organic Peroxide. Any organic compound having a double oxygen or peroxy (-O-O-) group in its chemical structure. (432:1-5)

2-1.114* Organic Peroxide Formulation. A pure organic peroxide or a mixture of one or more organic peroxides with one or more other materials in various combinations and concentrations. (432:1-5)

2-1.115 Organic Peroxide Storage Area. An area used for the storage of organic peroxide formulations. (432:1-5)

2-1.115.1 Cut-off Storage. Cut-off storage refers to storage in the same building or inside area, but physically separated from incompatible materials by partitions or walls. (See Chapter 4 of NFPA 432.) (432:1-7.2)

2-1.115.2 Detached Storage. Detached storage refers to storage in either an open outside area or a separate building containing no incompatible materials and located away from all other structures. (See Chapter 5 of NFPA 432.) (432:1-7.3)

2-1.115.3 Segregated Storage. Segregated storage refers to storage in the same room or inside area, but physically separated by distance from incompatible materials. Sills, curbs, intervening storage of nonhazardous compatible materials, and aisles shall be permitted to be used as aids in maintaining spacing. (See Chapter 3 of NFPA 432.) (432:1-7.1)

2-1.116 OSHA. The Occupational Safety Health Administration of the U.S. Department of Labor. (55:1-4)

2-1.117* Oxidizer. Any material that readily yields oxygen or other oxidizing gas, or that readily reacts to promote or initiate combustion of combustible materials. (430:1-5.13)

2-1.118 Parking Structure. A building, structure, or portion thereof used for the parking, or storage, or both, of motor vehicles. A parking structure shall be permitted to be enclosed or open, shall be permitted to use ramps, and shall be permitted to use mechanical control push-button-type elevators to transfer vehicles from one floor to another. Motor vehicles are permitted to be parked by the driver or an attendant, or are permitted to be parked mechanically by automatic facilities. Where automatic parking is provided, the operator of those facilities shall be permitted either to remain at the entry level or to travel to another level. Motor fuel shall be permitted to be dispensed, and motor vehicles shall be permitted to be serviced in a parking structure. (88A:2-1)

2-1.118.1 Basement and Underground Parking Structures. Parking structures that are located below grade. A basement parking structure has other occupancies above it; an underground parking structure has no occupancy other than parking above it. Basement and underground parking structures are considered as specific cases of enclosed parking structures. (88A:2-1)

2-1.118.2 Enclosed Parking Structure. Any parking structure that is not an open parking structure. (88A:2-1)

2-1.118.3 Open Parking Structures. A parking structure that, at each parking level, has wall openings open to the atmosphere, for an area of not less than 1.4 ft² (0.13 m²) for each linear foot (0.3 m) of its exterior perimeter. Such openings are distributed over 40 percent of the building perimeter or uniformly over two opposing sides. Interior walls lines and column lines are at least 20 percent open, with openings distributed to provide ventilation. (88A:2-1)

2-1.119 Patch Kettle. Any pot or container with a capacity of less than 6 gal (22.7 L) used for preheating tar, asphalt, pitch, or similar substances for the repair of roofs, streets, floors, pipes, or similar objects.

2-1.120 Permit. A document issued by the authority having jurisdiction for the purpose of authorizing performance of a specified activity.

2-1.121 Peroxide Forming Chemical. A chemical that, when exposed to air, will form explosive peroxides that are shock, pressure, or heat sensitive.

2-1.122* Personal Care. The care of residents who do not require chronic or convalescent medical or nursing care. (101:3.3.145)

2-1.123 Pesticide. Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest or for use as a plant regulator, defoliant, or desiccant. (434:1-5)

2-1.124 Physical Hazard. A classification of a chemical for which there is scientifically valid evidence that it is an organic peroxide or oxidizer.

2-1.125 Private Building. A building or that portion of a building that is normally not frequented by nor open to the public.

2-1.126 Process. The manufacturing, handling, blending, conversion, purification, recovery, separation, synthesis, or use, or any combination, of any commodity or material regulated by this code.

2-1.127 Professional Architect. An individual technically and legally qualified to practice the profession of architecture.

2-1.128 Professional Engineer. An individual technically and legally qualified to practice the profession of engineering.

2-1.129 Proprietary Information. Information regarding compounds or ingredients used in a process or production that do not qualify as trade secrets but that provide an industry or business with a competitive advantage.

2-1.130 Public Way. A street, alley, or other similar parcel of land essentially open to the outside air deeded, dedicated, or otherwise permanently appropriated to the public for public use and having a clear width and height of not less than 10 ft (3 m). (101:3.3.157)

2-1.131 Ramp. A walking surface that has a slope steeper than 1 in 20. (101:3.3.158)

2-1.132 Recommended Practice. A document that is similar in content and structure to a code or standard but that contains only nonmandatory provisions using the word "should" to indicate recommendations in the body of the text.

2-1.133 Reduced Flow Valve. A valve equipped with a restricted flow orifice and inserted into a compressed gas cylinder, portable or stationary tank that is designed to reduce the maximum flow from the valve under full flow conditions. The maximum flow rate from the valve is determined with the

valve allowed to flow to atmosphere with no other piping or fittings attached.

2-1.134 Repair Garages. Buildings, structures, or portions thereof wherein major repair, painting, or body and fender work is performed on motorized vehicles or automobiles; includes associated floor space used for offices, parking, or showrooms. (88B:1-3)

2-1.134.1 Commercial and Truck Repair Garages. Buildings, structures, or portions thereof used for the storage, maintenance, and repair of commercial motor vehicles or trucks, including fleets of motor vehicles operated by utilities, large businesses, mercantile, rental agencies, and other similar concerns. Facilities for the dispensing of motor fuels are commonly provided in connection with these garages. (88B:1-3)

2-1.134.2* Taxicab and Bus Repair Garages. Buildings, structures, or portions thereof used for storage, maintenance, and repair of fleets of taxicabs, sedan-limousine-type motor vehicles, or motor buses. Facilities for the dispensing of motor fuels are commonly provided in connection with these garages. (88B:1-3)

2-1.135* Residential Board and Care Occupancy. A building or portion thereof that is used for lodging and boarding of four or more residents, not related by blood or marriage to the owners or operators, for the purpose of providing personal care services. (101:3.3.134.13)

2-1.136 Residential Occupancy. An occupancy that provides sleeping accommodations for purposes other than health care or detention and correctional. (101:3.3.134.12)

2-1.137 Satellite Building. A structure that can be adjacent to but separated from the airport terminal building, accessible aboveground or through subway passages, and used to provide flight service operations, such as passenger check-in, waiting rooms, food service, enplaning or deplaning, etc. (415:1-4)

2-1.138 Self-Closing. Equipped with an approved device that ensures closing after opening. (101:3.3.174)

2-1.139 Service Stations.

2-1.139.1 Automotive Service Station. That portion of a property where liquids used as motor fuels are stored and dispensed from fixed equipment into the fuel tanks of motor vehicles or approved containers and shall include any facilities for the sale and service of tires, batteries, and accessories. This occupancy designation shall also apply to buildings, or portions of buildings, used for lubrication, inspection, and minor automotive maintenance work, such as tune-ups and brake system repairs. Major automotive repairs, painting, and body and fender work are excluded. (30A:1-2)

2-1.139.2 Marine Service Station. That portion of a property where liquids used as fuels are stored and dispensed from equipment on shore, piers, wharves, or floating docks into the fuel tanks of self-propelled craft and shall include all facilities used in connection therewith. (30A:1-2)

2-1.139.3 Service Station Located Inside Buildings. That portion of an automotive service station located within the perimeter of a building or building structure that also contains other occupancies. The service station shall be permitted to be enclosed or partially enclosed by the building walls, floors, ceilings, or partitions or shall be permitted to be open to the outside. The service station dispensing area shall mean that area of the service station required for dispensing of fuels to motor vehicles. Dispensing of fuel at manufacturing, assembly, and testing operations is not included within this definition. (30A:1-2)

2-1.140 Shall. Indicates a mandatory requirement.

2-1.141 Shop Drawings. Scaled working drawings, equipment cutsheets, and design calculations. (*See also 2-1.41, Construction Documents.*) (1031:2-1)

2-1.142 Should. Indicates a recommendation or that which is advised but not required.

2-1.143* Smoke Barrier. A continuous membrane, or a membrane with discontinuities created by protected openings, where such membrane is designed and constructed to restrict the movement of smoke. (101:3.3.20)

2-1.144* Smoke Compartment. A space within a building enclosed by smoke barriers on all sides, including the top and bottom. (101:3.3.183)

2-1.145 Smoke Detector. A device that detects visible or invisible particles of combustion. (101:3.3.184)

2-1.146 Smoking. The carrying or use of lighted pipe, cigar, cigarette, tobacco, or any other type of smoking substance.

2-1.147 Smoking Area. A designated area where smoking is permitted within premises where smoking is otherwise generally prohibited.

2-1.148 Special Uses. Includes but is not limited to events or occurrences where life safety-threatening situations or fire hazards exist or are likely to exist as determined by the authority having jurisdiction.

2-1.149* Spray Area. Any area in which dangerous quantities of flammable or combustible vapors, mists, residues, dusts, or deposits are present due to the operation of spray processes.

The spray area includes the following:

- (1) The interior of any spray booth or spray room, except as specifically provided for in Section 11-4 of NFPA 33
- (2) The interior of any exhaust plenum and any exhaust duct leading from the spray process
- (3) Any area in the direct path of a spray application process (33:1-6)

2-1.150 Spray Booth. A power-ventilated structure that encloses a spray application operation or process, and confines and limits the escape of the material being sprayed, including vapors, mists, dusts, and residues that are produced by the spraying operation and conducts or directs these materials to an exhaust system. Spray booths are manufactured in a variety of forms, including automotive refinishing, downdraft, open-face, traveling, tunnel, and updraft booths. This definition is not intended to limit the term "spray booth" to any particular design. The entire spray booth is considered part of the spray area. A spray booth is not a spray room. (33:1-6)

2-1.151 Spray Room. A power-ventilated fully-enclosed room used exclusively for open spraying of flammable or combustible materials. The entire spray room is considered part of the spray area. A spray booth is not a spray room. (33:1-6)

2-1.152 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

2-1.153 Standpipe System. An arrangement of piping, valves, hose connections, and allied equipment installed in a building or structure, with the hose connections located in such a manner

that water can be discharged in streams or spray patterns through attached hose and nozzles, for the purpose of extinguishing a fire, thereby protecting a building or structure and its contents in addition to protecting the occupants. This is accomplished by means of connections to water supply systems or by means of pumps, tanks, and other equipment necessary to provide an adequate supply of water to the hose connections. (14:1-4)

2-1.154* Storage Occupancy. An occupancy used primarily for the storage or sheltering of goods, merchandise, products, vehicles, or animals. (101:3.3.134.14)

2-1.155 Story. The portion of a building located between the upper surface of a floor and the upper surface of the floor or roof next above. (101:3.3.194)

2-1.156 STP (Standard Temperature and Pressure). A temperature of 70°F (21°C) and a pressure of 1 atmosphere (14.7 psi or 760 mm Hg).

2-1.157 Street. A public thoroughfare that has been dedicated for vehicular use by the public and can be used for access by fire department vehicles. (101:3.3.195)

2-1.158* Street Floor. A story or floor level accessible from the street or from outside a building at ground level, with the floor level at the main entrance located not more than three risers above or below ground level and arranged and utilized to qualify as the main floor. (101:3.3.196)

2-1.159* Structure. That which is built or constructed. (101:3.3.197)

2-1.160 Summarily Abate. To immediately judge a condition to be a fire hazard to life or property and to order immediate correction of such condition.

2-1.161 System. Several items of equipment assembled, grouped, or otherwise interconnected for the accomplishment of a purpose or function.

2-1.162 Temporary Wiring. Approved wiring for power and lighting during a period of construction, remodeling, maintenance, repair, or demolition, and decorative lighting, carnival power and lighting, and similar purposes.

2-1.163 Vaporizer. A device, other than a container, that receives LP-Gas in liquid form and adds sufficient heat to convert the liquid to a gaseous state. (58:1-6)

2-1.163.1 Vaporizer, Direct-Fired. A vaporizer in which heat furnished by a flame is directly applied to some form of heat exchange surface in contact with the liquid LP-Gas to be vaporized. This classification includes submerged-combustion vaporizers. (58:1-6)

2-1.163.2 Vaporizer, Indirect (also called Indirect-Fired). A vaporizer in which heat furnished by steam, hot water, the ground, surrounding air, or other heating medium is applied to a vaporizing chamber or to tubing, pipe coils, or other heat exchange surface containing the liquid LP-Gas to be vaporized; the heating of the medium used being at a point remote from the vaporizer. (58:1-6)

2-1.164 Water Capacity. The amount of water, in either pounds or gallons, at 60°F (15.6°C) required to fill a container liquid full of water. (58:1-6)

2-1.165 Written Notice. A notification in writing delivered in person to the individual or parties intended, or delivered at, or sent by certified or registered mail to, the last residential or business address of legal record.

Chapter 3 General Provisions

3-1 Fundamental Requirements.

3-1.1 Every new and existing building or structure shall be constructed, arranged, equipped, maintained, and operated in accordance with this Code so as to provide a reasonable level of life safety, property protection, and public welfare from the actual and potential hazards created by fire, explosion, and other hazardous conditions.

3-1.2 Every new and existing building shall comply with this Code and NFPA 101, *Life Safety Code*.

3-1.3 Any person who deliberately, or through negligence, sets fire to or causes the burning of any combustible material in such a manner as to endanger the safety of any person or property shall be deemed to be in violation of this Code.

3-1.4 Building Evacuation.

3-1.4.1 No person shall fail to leave a building when notified to do so when directed to leave by the authority having jurisdiction as a result of a known or perceived emergency.

3-1.4.2* No person shall fail to leave any overcrowded premises when told to do so by the management of the premises or the authority having jurisdiction. Premises are deemed to be overcrowded when the occupant load exceeds the exit capacity or the posted occupant load.

3-2* Fire Drills.

3-2.1 Where Required. Emergency egress and relocation drills conforming to the provisions of this Code shall be conducted as specified by the provisions of Chapter 8 of this Code or Chapters 11 through 42 of NFPA 101 or by appropriate action of the authority having jurisdiction. Drills shall be designed in cooperation with the local authorities. (101:4.7.1)

3-2.2* Drill Frequency. Emergency egress and relocation drills, where required by Chapter 8 of this Code or Chapters 11 through 42 of NFPA 101 or the authority having jurisdiction, shall be held with sufficient frequency to familiarize occupants with the drill procedure and to establish conduct of the drill as a matter of routine. Drills shall include suitable procedures to ensure that all persons subject to the drill participate. (101:4.7.2)

3-2.3 Competency. Responsibility for the planning and conduct of drills shall be assigned only to competent persons qualified to exercise leadership. (101:4.7.3)

3-2.4 Orderly Evacuation. In the conduct of drills, emphasis shall be placed on orderly evacuation rather than on speed. (101:4.7.4)

3-2.5* Simulated Conditions. Drills shall be held at expected and unexpected times and under varying conditions to simulate the unusual conditions that can occur in an actual emergency. (101:4.7.5)

3-2.6 Relocation Area. Drill participants shall relocate to a predetermined location and remain at such location until a recall or dismissal signal is given. (101:4.7.6)

3-3 Smoking.

3-3.1 Where smoking is considered a fire hazard, the authority having jurisdiction shall be authorized to order the owner

in writing to post “No Smoking” signs in conspicuous designated locations where smoking is prohibited.

3-3.2 In areas where smoking is permitted, noncombustible ash trays shall be provided.

3-3.3 Removal or destruction of any required “No Smoking” sign shall be prohibited.

3-3.4 Smoking or depositing any lighted or smoldering substance in a place where required “No Smoking” signs are posted shall be prohibited.

3-4 Open Outdoor Fires, Incinerators, and Outdoor Fireplaces.

3-4.1 Permits. Permits, where required, shall comply with Section 1-16.

Exception: Cooking fires.

3-4.2 Permitted open fires shall be located not less than 50 ft (15 m) from any structure. Burning hours shall be prescribed by the authority having jurisdiction.

3-4.3 Open fires and cooking fires shall be constantly attended by a competent person until such fire is extinguished. This person shall have a garden hose connected to the water supply or other fire extinguishing equipment readily available for use.

3-4.4 The authority having jurisdiction shall have the authority to prohibit any or all open fires when atmospheric conditions or local circumstances make such fires hazardous.

3-4.5 During that period of the year declared by the authority having jurisdiction to be the dry season, it shall be unlawful to set fires to any brush or forest covered land.

3-4.6 On such occasions when the chief executive of the jurisdiction declares a dry season and establishes special regulations on the use of any form of fire or smoking material, the authority having jurisdiction shall have the authority to assist in the enforcement of such regulations.

3-4.7 No charcoal burners shall be kindled or maintained on combustible balconies or within 10 ft (3 m) of combustible patios on ground floors.

Exception: Single-family dwellings.

3-4.8 Cylinders having water capacities greater than 2½ lb (1 kg) [nominal 1 lb (0.5 kg)] LP-Gas capacity shall not be located on balconies above the first floor that are attached to a multiple family dwelling of three or more living units located one above the other.

Exception: Where such balconies are served by outside stairways and where only such stairways are used to transport the cylinder. (58:3-4.9.2)

3-4.9 Every commercial incinerator and commercial barbecue fireplace shall be equipped and maintained with a spark arrestor and shall be maintained in good condition, working order, and repair at all times.

3-5 Fire Lanes.

3-5.1 Fire lanes shall be provided for all buildings that are set back more than 150 ft (46 m) from a public road or exceed 30 ft (9 m) in height and are set back over 50 ft (15 m) from a public road.

Exception: Where buildings are protected throughout with an approved automatic sprinkler system, the provisions of this section shall be permitted to be modified by the authority having jurisdiction.

3-5.2 Fire lanes shall be not less than 20 ft (6 m) of unobstructed width, able to withstand live loads of fire apparatus, and have a minimum of 13 ft 6 in. (4.1 m) of vertical clearance. An approved turnaround for fire apparatus shall be provided where an access road is a dead end and is in excess of 150 ft (46 m) in length. The turnaround shall have a minimum centerline radius of 50 ft (15 m). The grade, surface, and location of the fire lane shall be approved by the authority having jurisdiction.

Exception No. 1: T or Y turnaround arrangements shall be permitted.

Exception No. 2: When acceptable to the authority having jurisdiction, turnaround arrangements other than a cul-de-sac shall be permitted to be used.

3-5.3 Where a bridge is required to be used as access, it shall be constructed and maintained using live design loading sufficient to carry the imposed loads of the fire apparatus. Where an elevated surface is used as access, that portion utilized by fire apparatus shall be constructed and maintained to accommodate fire apparatus.

3-5.4 Fire lanes shall be marked with freestanding signs or marked curbs, sidewalks, or other traffic surfaces that have the words FIRE LANE — NO PARKING painted in contrasting colors at a size and spacing approved by the authority having jurisdiction.

3-5.5* Fire lanes shall be maintained free of all obstructions at all times.

Exception: Approved security gates and other movable barriers.

3-6 Access Boxes. The authority having jurisdiction shall have the authority to require an access box to be installed in an accessible location where access to or within a structure or area is difficult because of security. The access box shall be a type approved by the authority having jurisdiction and shall contain keys or other devices necessary to gain access as required by the authority having jurisdiction. The operator of the premises shall immediately notify the authority having jurisdiction, and provide the new keys or other devices, any time a lock is changed or rekeyed and a key or other device to that lock is contained in the access box.

3-7 Fire Protection Markings.

3-7.1 Premises Identification. New and existing buildings shall have approved address numbers placed in a position to be plainly legible and visible from the street or road fronting the property. These numbers shall contrast with their background. Address numbers shall be arabic numerals or alphabet letters.

3-7.2 Shaftways to Be Marked. Every outside opening accessible to the fire department that opens directly on any hoistway or shaftway communicating between two or more floors in a building shall be plainly marked with the word SHAFTWAY in red letters at least 6 in. (15.2 cm) high on a white background. Such warning signs shall be placed so as to be readily discernible from the outside of the building.

3-7.3* Stairway Marking.

3-7.3.1 Stairs serving five or more stories shall be provided with signage within the enclosure at each floor landing. The

signage shall indicate the story, the terminus of the top and bottom of the stair enclosure, and the identification of the stair enclosure. The signage also shall state the story of, and the direction to, exit discharge. The signage shall be inside the enclosure located approximately 5 ft (1.5 m) above the floor landing in a position that is readily visible when the door is in the open or closed position. (101:7.2.2.5.4)

3-7.3.2 Wherever an enclosed stair requires travel in an upward direction to reach the level of exit discharge, signs with directional indicators indicating the direction to the level of exit discharge shall be provided at each floor level landing from which upward direction of travel is required. Such signage shall be readily visible when the door is in the open or closed position.

Exception No. 1: This requirement shall not apply where signs required by 3-7.3.1 are provided.

Exception No. 2: Stairs extending not more than one story below the level of exit discharge where the exit discharge is clearly obvious shall not be subject to this requirement. (101:7.2.2.5.5)

3-7.3.3 The sign shall be painted or stenciled on the wall or on a separate sign securely attached to the wall.

3-7.3.4 Letters and numerals shall be of bold type and of contrasting color to the background.

3-7.3.5 The stairway identification letter shall be placed at the top of the sign in minimum 1 in. (2.5 cm) high bold block lettering.

3-7.3.6 Roof access or no roof access shall be designated by the words "Roof Access" or "No Roof Access" and placed under the stairway identification letter. Lettering shall be a minimum of 1 in. (2.5 cm) high bold block lettering.

Exception: Existing approved signs.

3-7.3.7 The floor level number shall be placed in the middle of the sign in minimum 5 in. (12.7 cm) high bold block lettering. Mezzanine levels shall have the letter "M" or other appropriate identification letter preceding the floor number, while basement levels shall have the letter "B" or other appropriate identification letter preceding the floor level number.

3-7.3.8 The lower and upper terminus of the stairway shall be placed at the bottom of the sign in minimum 1 in. (2.5 cm) high bold block lettering.

3-7.3.9 These signs shall be maintained in an approved manner.

3-8 Vacant Buildings.

3-8.1 Every person owning or having charge or control of any vacant building shall remove all combustible waste and refuse therefrom and lock, barricade, or otherwise secure all windows, doors, and other openings in the building to prohibit entry by unauthorized persons.

Exception: This requirement shall not apply to vacation or resort facilities or buildings used on a seasonal basis or the temporary vacancy of a building for tenant change or remodeling purposes.

3-8.2 Buildings that are vacant shall maintain all required sprinklers and standpipe systems, and the associated water-flow, and sprinkler supervisory alarm systems in service.

Exception: As approved by the authority having jurisdiction.

3-8.3 The authority having jurisdiction shall have the authority to require an inspection and test of any sprinkler system, standpipe system, or fire alarm system that has been out of service for 30 days or more before restored back into service.

3-9 Combustible Vegetation.

3-9.1 Combustible vegetation and natural cut Christmas trees shall not be permitted in assembly, educational, day-care, health care, residential board and care, detention and correctional, mercantile, hotel, or dormitory occupancies.

Exception No. 1: Day-care homes.

Exception No. 2: Living trees in a balled condition with their roots protected by an earth ball shall be permitted provided they are maintained in a fresh condition and are not allowed to become dry.

Exception No. 3: Trees located in areas protected by an approved automatic sprinkler system.

3-9.2 Artificial combustible vegetation and Christmas trees shall be labeled or otherwise identified or certified by the manufacturer as being flame retardant or flame resistive.

3-9.3 No combustible vegetation and Christmas trees shall be allowed to obstruct corridors, exit ways, or other means of egress.

3-9.4 Only listed electrical lights and wiring shall be used on combustible vegetation, Christmas trees, and similar decorations.

3-9.5 Electrical lights shall be prohibited on metal artificial trees.

3-9.6 Open flames such as from candles, lanterns, kerosene heaters, and gas-fired heaters shall not be located on or near combustible vegetation, Christmas trees, or other similar combustible materials.

3-9.7 Combustible vegetation and natural cut Christmas trees shall not be located near heating vents or other fixed or portable heating devices that could cause it to dry out prematurely or to be ignited.

3-9.8 In occupancies where natural trees are permitted, the bottom end of the trunk shall have a straight fresh cut of at least $\frac{1}{2}$ in. (13 mm) above the end prior to placing the tree in a stand to allow the tree to absorb water. The tree shall be placed in a suitable stand with adequate water. The water level shall be maintained above the fresh cut and checked at least once daily. The tree shall be removed from the building immediately upon evidence of dryness.

3-10 Special Outdoor Events, Carnivals, and Fairs.

3-10.1 Permits. Permits, where required, shall comply with Section 1-16.

3-10.2 The authority having jurisdiction shall be permitted to regulate all outdoor events such as carnivals and fairs as it pertains to access for emergency vehicles; access to fire protection equipment; placement of stands, concession booths, and exhibits; and the control of hazardous conditions dangerous to life and property.

3-10.3 The authority having jurisdiction shall be permitted to require standby fire personnel when potentially hazardous conditions exist, due to the type of performance, display, exhibit, or activity, or the number of persons present.

3-10.4 A minimum of one portable fire extinguisher shall be provided, when required by the authority having jurisdiction, for each concession stand in accordance with Section 7-6.

3-10.5 A minimum of one single station smoke alarm shall be located in all stock or equipment trailers when they are used for sleeping purposes.

3-10.6 Electrical equipment and installations shall comply with Section 6-1.

Chapter 4 Means of Egress

4-1 Application. Means of egress in new and existing buildings shall comply with this Code and the referenced edition of NFPA 101, *Life Safety Code*.

4-1.1 All inside stairs serving as an exit or exit component shall be enclosed in accordance with 7.1.3.2 of NFPA 101. All other inside stairs shall be protected in accordance with 8.2.5 of NFPA 101.

Exception: In existing buildings, where a two-story exit enclosure connects the story of exit discharge with an adjacent story, the exit shall be permitted to be enclosed only on the story of exit discharge, provided that not less than 50 percent of the number and capacity of exits on the story of exit discharge are independent of such enclosures. (101:7.2.2.5.1)

4-1.2* An exit enclosure shall not be used for any purpose that has the potential to interfere with its use as an exit and, if so designated, as an area of refuge. (See also 4-1.3.) (101:7.1.3.2.3)

4-1.3* There shall be no enclosed, usable space within an exit enclosure, including under stairs, nor shall any open space within the enclosure be used for any purpose that has the potential to interfere with egress.

Exception: Enclosed, usable space shall be permitted under stairs, provided that the space is separated from the stair enclosure by the same fire resistance as the exit enclosure. Entrance to such enclosed usable space shall not be from within the stair enclosure. (See also 4-1.2.) (101:7.2.2.5.3)

4-1.4 Exit Access Corridors. Corridors used as exit access and serving an area having an occupant load exceeding 30 shall be separated from other parts of the building by walls having not less than a 1-hour fire resistance rating in accordance with 8.2.3 of NFPA 101.

Exception No. 1: This requirement shall not apply to existing buildings, provided the occupancy classification does not change.

Exception No. 2: This requirement shall not apply where otherwise provided in Chapters 12 through 42 of NFPA 101. (101:7.1.3.1)

4-1.5 Enclosure.

4-1.5.1 An exit passageway shall be separated from other parts of the building as specified in 7.1.3.2 of NFPA 101.

Exception No. 1: Fire windows in accordance with 8.2.3.2.2 of NFPA 101 shall be permitted to be installed in such a separation in a building protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101.

Exception No. 2: Existing fixed wired glass panels in steel sash shall be permitted to be continued in use in such a separation in buildings protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101. (101:7.2.6.2)

4-1.5.2 Stair Discharge. An exit passageway that serves as a discharge from a stair enclosure shall have not less than the same fire resistance rating and opening protective fire protection rating as those required for the stair enclosure. (101:7.2.6.3)

4-1.6* Interior Finish in Exits. The flame spread rating of interior finish on walls and ceilings shall be in accordance with NFPA 101.

4-1.7 Doors.

4-1.7.1 Any device or alarm installed to restrict the improper use of a means of egress shall be designed and installed so that it cannot, even in case of failure, impede or prevent emergency use of such means of egress unless otherwise provided in 7.2.1.6 of NFPA 101 and Chapters 18, 19, 22, and 23 of NFPA 101. (101:7.1.9)

4-1.7.2 Every door and every principal entrance that is required to serve as an exit shall be designed and constructed so that the path of egress travel is obvious and direct. Windows that, because of their physical configuration or design and the materials used in their construction, have the potential to be mistaken for doors shall be made inaccessible to the occupants by barriers or railings. (101:7.2.1.1.2)

4-1.8 Swing and Force to Open.

4-1.8.1* Any door in a means of egress shall be of the side-hinged or pivoted-swinging type. The door shall be designed and installed so that it is capable of swinging from any position to the full required width of the opening in which it is installed.

Exception No. 1: Sliding doors as provided in Chapters 22 and 23 of NFPA 101, and doors as provided in Chapters 24, 32, and 33 of NFPA 101.

Exception No. 2: Where permitted in Chapters 12 through 42 of NFPA 101, horizontal sliding or vertical rolling security grilles or doors that are part of the required means of egress shall be permitted, provided that they meet the following criteria:

(a) Such grilles or doors shall remain secured in the full open position during the period of occupancy by the general public.

(b) On or adjacent to the grille or door, there shall be a readily visible, durable sign in letters not less than 1 in. (2.5 cm) high on a contrasting background that reads as follows:

THIS DOOR TO REMAIN OPEN

WHEN THE BUILDING IS OCCUPIED

(c) Doors or grilles shall not be brought to the closed position when the space is occupied.

(d) Doors or grilles shall be operable from within the space without the use of any special knowledge or effort.

(e) Where two or more means of egress are required, not more than half of the means of egress shall be equipped with horizontal sliding or vertical rolling grilles or doors.

Exception No. 3: Horizontal sliding doors complying with 7.2.1.14 of NFPA 101 shall be permitted.

Exception No. 4: Doors to private garages, business areas, industrial areas, and storage areas with an occupant load not exceeding 10, where such private garages, business areas, industrial areas, and storage areas contain low or ordinary hazard contents, shall be exempt from this requirement.

Exception No. 5: Revolving doors complying with 7.2.1.10 of NFPA 101 shall be permitted.

Exception No. 6: Existing fusible link-operated horizontal sliding or vertical rolling fire doors shall be permitted to be used as provided in Chapters 12 through 42 of NFPA 101. (101:7.2.1.4.1)

4-1.8.2 Doors required to be of the side-hinged or pivoted-swinging type shall swing in the direction of egress travel where serving a room or area with an occupant load of 50 or more.

Exception No. 1: Doors in horizontal exits shall not be required to swing in the direction of egress travel where exempted in 7.2.4.3.6 of NFPA 101.

Exception No. 2: Smoke barrier doors shall not be required to swing in the direction of egress travel as provided in Chapter 19 of NFPA 101. (101:7.2.1.4.2)

4-1.8.3 A door shall swing in the direction of egress travel where used in an exit enclosure or where serving a high hazard contents area, unless it is a door from an individual living unit that opens directly into an exit enclosure. (101:7.2.1.4.3)

4-1.8.4* During its swing, any door in a means of egress shall leave not less than one-half of the required width of an aisle, corridor, passageway, or landing unobstructed and shall not project more than 7 in. (17.8 cm) into the required width of an aisle, corridor, passageway, or landing, when fully open. Doors shall not open directly onto a stair without a landing. The landing shall have a width not less than the width of the door. (See 7.2.1.3 of NFPA 101.)

Exception: In existing buildings, a door providing access to a stair shall not be required to maintain any minimum unobstructed width during its swing, provided that it meets the requirement that limits projection to not more than 7 in. (17.8 cm) into the required width of a stair or landing when the door is fully open. (101:7.2.1.4.4)

4-1.8.5 The forces required to fully open any door manually in a means of egress shall not exceed 15 lbf (67 N) to release the latch, 30 lbf (133 N) to set the door in motion, and 15 lbf (67 N) to open the door to the minimum required width. Opening forces for interior side-hinged or pivoted-swinging doors without closers shall not exceed 5 lbf (22 N). These forces shall be applied at the latch stile.

Exception No. 1: The opening force for existing doors in existing buildings shall not exceed 50 lbf (222 N) applied to the latch stile.

Exception No. 2: The opening forces for horizontal sliding doors shall be as provided in Chapters 22 and 23 of NFPA 101.

Exception No. 3: The opening forces for power-operated doors shall be as provided in 7.2.1.9 of NFPA 101. (101:7.2.1.4.5)

4-1.8.6 Screen doors and storm doors used in a means of egress shall be subject to the requirements for direction of swing that are applicable to other doors used in a means of egress. (101:7.2.1.4.6)

4-1.9 Locks, Latches, and Alarm Devices.

4-1.9.1 Doors shall be arranged to be opened readily from the egress side whenever the building is occupied. Locks, if provided, shall not require the use of a key, a tool, or special knowledge or effort for operation from the egress side.

Exception No. 1: This requirement shall not apply where otherwise provided in Chapters 18 through 23 of NFPA 101.

Exception No. 2: Exterior doors shall be permitted to have key-operated locks from the egress side, provided that the following criteria are met:

(a) *Permission to use this exception is provided in Chapters 12 through 42 of NFPA 101 for the specific occupancy.*

(b) *On or adjacent to the door, there is a readily visible, durable sign in letters not less than 1 in. (2.5 cm) high on a contrasting background that reads as follows:*

THIS DOOR TO REMAIN UNLOCKED

WHEN THE BUILDING IS OCCUPIED

(c) *The locking device is of a type that is readily distinguishable as locked.*

(d) *A key is immediately available to any occupant inside the building when it is locked.*

Exception No. 2 shall be permitted to be revoked by the authority

having jurisdiction for cause.

Exception No. 3: Where permitted in Chapters 12 through 42 of NFPA 101, key operation shall be permitted, provided that the key cannot be removed when the door is locked from the side from which egress is to be made. (101:7.2.1.5.1)

4-1.9.2* Every door in a stair enclosure serving more than four stories shall allow re-entry from the stair enclosure to the interior of the building, or an automatic release shall be provided to unlock all stair enclosure doors to allow re-entry. Such automatic release shall be actuated with the initiation of the building fire alarm system.

Exception No. 1: Doors on stair enclosures shall be permitted to be equipped with hardware that prevents re-entry into the interior of the building, provided that the following criteria are met:

(a) *There shall be not less than two levels where it is possible to leave the stair enclosure.*

(b) *There shall be not more than four stories intervening between stories where it is possible to leave the stair enclosure.*

(c) *Re-entry shall be possible on the top or next to top story that allows access to another exit.*

(d) *Doors allowing re-entry shall be identified as such on the stair side of the door.*

(e) *Doors not allowing re-entry shall be provided with a sign on the stair side indicating the location of the nearest door, in each direction of travel, that allows re-entry or exit.*

Exception No. 2: This requirement shall not apply to the following:

(a) *Existing installations as permitted in Chapters 12 through 42 of NFPA 101*

(b) *Stair enclosures serving a building permitted to have a single exit in accordance with Chapters 11 through 42 of NFPA 101*

(c) *Stair enclosures where otherwise provided in Chapters 18 and 22 of NFPA 101 (101:7.2.1.5.2)*

4-1.9.3 If a stair enclosure allows access to the roof of the building, the door to the roof either shall be kept locked or shall allow re-entry from the roof. (101:7.2.1.5.3)

4-1.9.4* A latch or other fastening device on a door shall be provided with a releasing device having an obvious method of operation and that is readily operated under all lighting conditions. The releasing mechanism for any latch shall be located not less than 34 in. (86 cm), and not more than 48 in. (122 cm), above the finished floor. Doors shall be operable with not more than one releasing operation.

Exception No. 1: Egress doors from individual living units and guest rooms of residential occupancies shall be permitted to be provided with devices that require not more than one additional releasing operation, provided that such device is operable from the inside without the use of a key or tool and is mounted at a height not exceeding 48 in. (122 cm) above the finished floor. Existing security devices shall be permitted to have two additional releasing operations. Existing security devices other than automatic latching devices shall not be located more than 60 in. (152 cm) above the finished floor. Automatic latching devices shall not be located more than 48 in. (122 cm) above the finished floor.

Exception No. 2: The minimum mounting height for the releasing mechanism shall not be applicable to existing installations. (101:7.2.1.5.4)

4-1.9.5 Where pairs of doors are required in a means of egress, each leaf of the pair shall be provided with its own releasing device. Devices that depend on the release of one door before the other shall not be used.

Exception: Where exit doors are used in pairs and approved automatic flush bolts are used, the door leaf equipped with the automatic flush bolts shall have no doorknob or surface-mounted hardware. The unlatching of any leaf shall not require more than one operation. (101:7.2.1.5.5)

4-1.9.6* Devices shall not be installed in connection with any door on which panic hardware or fire exit hardware is required where such device prevents or is intended to prevent the free use of the door for purposes of egress.

Exception: This requirement shall not apply where otherwise provided in 4-1.10. (101:7.2.1.5.6)

4-1.10 Special Locking Arrangements.

4-1.10.1 Delayed Egress Locks. Approved, listed, delayed-egress locks shall be permitted to be installed on doors serving low and ordinary hazard contents in buildings protected throughout by an approved, supervised automatic fire detection system in accordance with Section 9.6 of NFPA 101, or an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101, and where permitted in Chapters 12 through 42 of NFPA 101, provided that the following criteria are met.

(a) The doors shall unlock upon actuation of an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101 or upon the actuation of any heat detector or activation of not more than two smoke detectors of an approved, supervised automatic fire detection system in accordance with Section 9.6 of NFPA 101.

(b) The doors shall unlock upon loss of power controlling the lock or locking mechanism.

(c) An irreversible process shall release the lock within 15 seconds upon application of a force to the release device required in 4-1.9.4 that shall not be required to exceed 15 lbf (67 N) nor be required to be continuously applied for more than 3 seconds. The initiation of the release process shall activate an audible signal in the vicinity of the door. Once the door lock has been released by the application of force to the releasing device, relocking shall be by manual means only.

Exception: Where approved by the authority having jurisdiction, a delay not exceeding 30 seconds shall be permitted.

(d) *On the door adjacent to the release device, there shall be a readily visible, durable sign in letters not less than 1 in. (2.5 cm) high and not less than 1/8 in. (0.3 cm) in stroke width on a contrasting background that reads as follows:

PUSH UNTIL ALARM SOUNDS

DOOR CAN BE OPENED IN 15 SECONDS

(101:7.2.1.6.1)

4-1.10.2 Access-Controlled Egress Doors. Where permitted in Chapters 11 through 42 of NFPA 101, doors in the means of egress shall be permitted to be equipped with an approved entrance and egress access control system, provided that the following criteria are met.

(a) A sensor shall be provided on the egress side and arranged to detect an occupant approaching the doors, and the doors shall be arranged to unlock in the direction of egress upon detection of an approaching occupant or loss of power to the sensor.

(b) Loss of power to the part of the access control system that locks the doors shall automatically unlock the doors in the direction of egress.

(c) The doors shall be arranged to unlock in the direction of egress from a manual release device located 40 in. to 48 in. (102 cm to 122 cm) vertically above the floor and within 5 ft (1.5 m) of the secured doors. The manual release device shall be readily accessible and clearly identified by a sign that reads as follows:

PUSH TO EXIT

When operated, the manual release device shall result in direct interruption of power to the lock — independent of the access control system electronics — and the doors shall remain unlocked for not less than 30 seconds.

(d) Activation of the building fire-protective signaling system, if provided, shall automatically unlock the doors in the direction of egress, and the doors shall remain unlocked until the fire-protective signaling system has been manually reset.

(e) Activation of the building automatic sprinkler or fire detection system, if provided, shall automatically unlock the doors in the direction of egress and the doors shall remain unlocked until the fire-protective signaling system has been manually reset. (101:7.2.1.6.2)

4-1.11 Self-Closing Devices.

4-1.11.1 A door normally required to be kept closed shall not be secured in the open position at any time and shall be self-closing or automatic-closing in accordance with 4-1.11.2. (101:7.2.1.8.1)

4-1.11.2 In any building of low or ordinary hazard contents, as described in 6.2.2.2 and 6.2.2.3 of NFPA 101, or where approved by the authority having jurisdiction, doors shall be permitted to be automatic-closing, provided that the following criteria are met:

- (1) Upon release of the hold-open mechanism, the door becomes self-closing.
- (2) The release device is designed so that the door instantly releases manually and upon release becomes self-closing, or the door can be readily closed.
- (3) The automatic releasing mechanism or medium is activated by the operation of approved smoke detectors installed in accordance with the requirements for smoke detectors for door release service in NFPA 72, *National Fire Alarm Code*®.
- (4) Upon loss of power to the hold-open device, the hold-open mechanism is released and the door becomes self-closing.
- (5) The release by means of smoke detection of one door in a stair enclosure results in closing all doors serving that stair. (101:7.2.1.8.2)

4-2 Minimum Width.

4-2.1 The width of any means of egress shall be not less than that required for a given egress component in Chapter 7 of NFPA 101 or Chapters 12 through 42 of NFPA 101, and shall be not less than 36 in. (91 cm).

*Exception No. 1:** The width of exit access formed by furniture and movable partitions, serving not more than six people and having a length not exceeding 50 ft (15 m), shall be not less than 18 in. (45.7 cm) at and below a height of 38 in. (96 cm), or 28 in. (71 cm) above a height of 38 in. (96 cm), provided that widths not less than 36 in. (91 cm) for new exit access and 28 in. (71 cm) for existing exit access are provided without moving permanent walls.

Exception No. 2: This requirement shall not apply to doors as otherwise provided for in 7.2.1.2 of NFPA 101.

Exception No. 3: In existing buildings, the width shall be permitted to be not less than 28 in. (71 cm).

Exception No. 4: This requirement shall not apply to aisles and aisle accessways as otherwise provided in Chapters 12 and 13 of NFPA 101.

Exception No. 5: This requirement shall not apply to industrial equipment access as otherwise provided in Chapter 40 of NFPA 101. (101:7.3.4.1)

4-2.2 Where a single exit access leads to an exit, its capacity in terms of width shall be not less than the required capacity of the exit to which it leads. Where more than one exit access leads to an exit, each shall have a width adequate for the number of persons it accommodates. (101:7.3.4.2)

4-3 Number of Means of Egress.

4-3.1 The number of means of egress from any balcony, mezzanine, story, or portion thereof shall be not less than two.

Exception No. 1: This requirement shall not apply where a single means of egress is permitted in Chapters 11 through 42 of NFPA 101.

Exception No. 2: A mezzanine or balcony shall be permitted to have a single means of egress, provided that the common path of travel limitations of Chapters 12 through 42 of NFPA 101 are met. (101:7.4.1.1)

4-3.2 The number of means of egress from any story or portion thereof, other than for existing buildings as permitted in Chapters 12 through 42 of NFPA 101, shall be as follows:

- (1) Occupant load more than 500 but not more than 1000 — not less than 3
- (2) Occupant load more than 1000 — not less than 4 (101:7.4.1.2)

4-3.3 Accessible means of egress in accordance with 7.5.4 of NFPA 101, not utilizing elevators, shall be permitted to serve as any or all of the required minimum number of means of egress. (101:7.4.1.3)

4-3.4 The occupant load of each story considered individually shall be required to be used in computing the number of means of egress at each story, provided that the required number of means of egress is not decreased in the direction of egress travel. (101:7.4.1.4)

4-3.5 Doors, other than the hoistway door; the elevator car door; and doors that are readily openable from the car side without a key, tool, special knowledge, or special effort, shall be prohibited at the point of access to an elevator car. (101:7.4.1.5)

4-3.6 Elevator lobbies shall have access to at least one exit. Such exit access shall not require the use of a key, tool, special knowledge, or special effort. (101:7.4.1.6)

4-4 Arrangement of Means of Egress.

4-4.1 Exits shall be located and exit access shall be arranged so that exits are readily accessible at all times. (101:7.5.1.1)

4-4.2* Where exits are not immediately accessible from an open floor area, continuous passageways, aisles, or corridors leading directly to every exit shall be maintained and shall be arranged to provide access for each occupant to not less than two exits by separate ways of travel. Exit access corridors shall provide access to not less than two approved exits without passing through any intervening rooms other than corridors, lobbies, and other spaces permitted to be open to the corridor.

Exception No. 1: This requirement shall not apply where a single exit is permitted in Chapters 12 through 42 of NFPA 101.

Exception No. 2: Where common paths of travel are permitted for an occupancy in Chapters 12 through 42 of NFPA 101, such common paths of travel shall be permitted but shall not exceed the limit specified.

Exception No. 3: Existing corridors that require passage through a room to access an exit shall be permitted to continue to be used, provided that the following criteria are met:

(a) Such arrangement is approved by the authority having jurisdiction.

(b) The path of travel is marked in accordance with Section 7.10 of NFPA 101.

(c) Doors to such rooms comply with 7.2.1 of NFPA 101.

(d) Such arrangement is not prohibited by the occupancy chapter.

Exception No. 4: Corridors that are not required to be fire resistance rated shall be permitted to discharge into open floor plan areas. (101:7.5.1.2)

4-4.3 Where more than one exit is required from a building or portion thereof, such exits shall be remotely located from each other and shall be arranged and constructed to minimize the possibility that more than one has the potential to be blocked by any one fire or other emergency condition. (101:7.5.1.3)

4-4.4* Exit access shall be arranged so that there are no dead ends in corridors, unless permitted by and limited to the length specified in Chapters 12 through 42 of NFPA 101. (101:7.5.1.6)

4-4.5 Exit access from rooms or spaces shall be permitted to be through adjoining or intervening rooms or areas, provided that such adjoining rooms are accessory to the area served. Foyers, lobbies, and reception rooms constructed as required for corridors shall not be construed as intervening rooms. Exit access shall be arranged so that it is not necessary to pass through any area identified under Protection from Hazards in Chapters 11 through 42 of NFPA 101. (101:7.5.1.7)

4-5 Occupant Load.

4-5.1 The total capacity of the means of egress for any story, balcony, tier, or other occupied space shall be sufficient for the occupant load thereof. (101:7.3.1.1)

4-5.2 The occupant load in any building or portion thereof shall be not less than the number of persons determined by dividing the floor area assigned to that use by the occupant load factor for that use as specified in Table 4-5.2. Where both gross and net area figures are given for the same occupancy, calculations shall be made by applying the gross area figure to the gross area of the portion of the building devoted to the use for which the gross area figure is specified and by applying the net area figure to the net area of the use for which the net area figure is specified. (101:7.3.1.2)

4-5.3 Occupant Load Increases.

4-5.3.1 The occupant load in any building or portion thereof shall be permitted to be increased from the occupant load established for the given use in accordance with 4-5.2 where all other requirements of this Code and NFPA 101 are also met, based on such increased occupant load. (101:7.3.1.3.1)

4-5.3.2 The authority having jurisdiction shall be permitted to require an approved aisle, seating, or fixed equipment diagram to substantiate any increase in occupant load and shall be permitted to require that such a diagram be posted in an approved location. (101:7.3.1.3.2)

Table 4-5.2 Occupant Load Factor

| Use | ft ² † (per person) | m ² † (per person) |
|---|--|--|
| Assembly Use | | |
| Concentrated use, without fixed seating | 7 net | 0.65 net |
| Less concentrated use, without fixed seating | 15 net | 1.4 net |
| Bench-type seating | 1 person/18 linear in. | 1 person/45.7 linear cm |
| Fixed seating | Number of fixed seats | Number of fixed seats |
| Waiting spaces | See 12.1.7.2 and 13.1.7.2 of NFPA 101. | See 12.1.7.2 and 13.1.7.2 of NFPA 101. |
| Kitchens | 100 | 9.3 |
| Library stack areas | 100 | 9.3 |
| Library reading rooms | 50 net | 4.6 net |
| Swimming pools | 50 — of water surface | 4.6 — of water surface |
| Swimming pool decks | 30 | 2.8 |
| Exercise rooms with equipment | 50 | 4.6 |
| Exercise rooms without equipment | 15 | 1.4 |
| Stages | 15 net | 1.4 net |
| Lighting and access catwalks, galleries, gridirons | 100 net | 9.3 net |
| Casinos and similar gaming areas | 11 | 1 |
| Skating rinks | 50 | 4.6 |
| Educational Use | | |
| Classrooms | 20 net | 1.9 net |
| Shops, laboratories, vocational rooms | 50 net | 4.6 net |
| Day-Care Use | | |
| | 35 net | 3.3 net |
| Health Care Use | | |
| Inpatient treatment departments | 240 | 22.3 |
| Sleeping departments | 120 | 11.1 |
| Detention and Correctional Use | | |
| | 120 | 11.1 |
| Residential Use | | |
| Hotels and dormitories | 200 | 18.6 |
| Apartment buildings | 200 | 18.6 |
| Board and care, large | 200 | 18.6 |
| Industrial Use | | |
| General and high hazard industrial | 100 | 9.3 |
| Special purpose industrial | NA‡ | NA‡ |
| Business Use | | |
| | 100 | 9.3 |
| Storage Use (other than mercantile storerooms) | | |
| | NA‡ | NA‡ |

Table 4-5.2 Occupant Load Factor (Continued)

| Use | ft ² † (per person) | m ² † (per person) |
|---|---|---|
| Mercantile Use | | |
| Sales area on street floor § [◇] | 30 | 2.8 |
| Sales area on two or more street floors [◇] | 40 | 3.7 |
| Sales area on floor below street floor [◇] | 30 | 2.8 |
| Sales area on floors above street floor [◇] | 60 | 5.6 |
| Floors or portions of floors used only for offices | See business use. | See business use. |
| Floors or portions of floors used only for storage, receiving, and shipping, and not open to general public | 300 | 27.9 |
| Covered mall buildings | Per factors applicable to use of space [#] | Per factors applicable to use of space [#] |

†All factors expressed in gross area unless marked “net”.

‡Not applicable. The occupant load shall be not less than the maximum probable number of occupants present at any time.

§For the purpose of determining occupant load in mercantile occupancies where, due to differences in grade of streets on different sides, two or more floors directly accessible from streets (not including alleys or similar back streets) exist, each such floor shall be considered a street floor. The occupant load factor shall be one person for each 40 ft² (3.7 m²) of gross floor area of sales space.

◇In mercantile occupancies with no street floor, as defined in 2-1.158, but with access directly from the street by stairs or escalators, the principal floor at the point of entrance to the mercantile occupancy shall be considered the street floor.

#The portions of the covered mall, where considered a pedestrian way and not used as gross leasable area, shall not be assessed an occupant load based on Table 4-5.2. However, means of egress from a covered mall pedestrian way shall be provided for an occupant load determined by dividing the gross leasable area of the covered mall building (not including anchor stores) by the appropriate lowest whole number occupant load factor from Figure 4-5.2.

Each individual tenant space shall have means of egress to the outside or to the covered mall based on occupant loads figured by using the appropriate occupant load factor from Table 4-5.2.

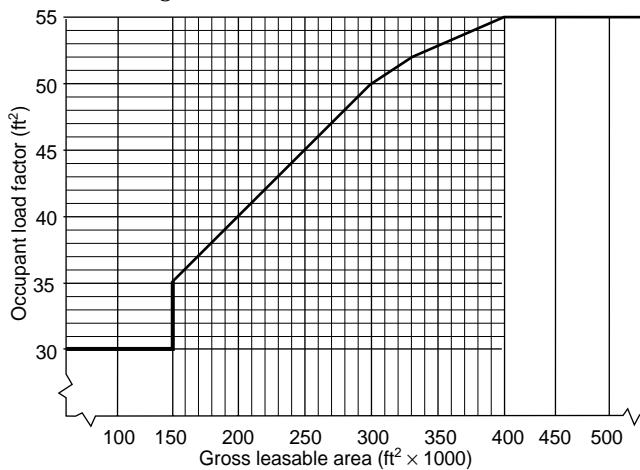
Each individual anchor store shall have means of egress independent of the covered mall. (101:7.3.1.2)

4-5.4 Where exits serve more than one story, only the occupant load of each story considered individually shall be used in computing the required capacity of the exits at that story, provided that the required egress capacity of the exit is not decreased in the direction of egress travel. (101:7.3.1.4)

4-5.5 Where means of egress from a story above and a story below converge at an intermediate story, the capacity of the means of egress from the point of convergence shall be not less than the sum of the capacity of the two means of egress. (101:7.3.1.5)

4-5.6 Where any required egress capacity from a balcony or mezzanine passes through the room below, that required capacity shall be added to the required egress capacity of the room in which it is located. (101:7.3.1.6)

FIGURE 4-5.2 Covered mall buildings occupant load factors. (101:Figure 7.3.1.2)



Note: For SI units, 1 ft² = 0.093 m².

4-6 Illumination of Means of Egress.

4-6.1* Illumination of means of egress shall be provided in accordance with Section 7.8 of NFPA 101 for every building and structure where required in Chapters 11 through 42 of NFPA 101. For the purposes of this requirement, exit access shall include only designated stairs, aisles, corridors, ramps, escalators, and passageways leading to an exit. For the purposes of this requirement, exit discharge shall include only designated stairs, aisles, corridors, ramps, escalators, walkways, and exit passageways leading to a public way. (101:7.8.1.1)

4-6.2 Illumination of means of egress shall be continuous during the time that the conditions of occupancy require that the means of egress be available for use. Artificial lighting shall be employed at such locations and for such periods of time as required to maintain the illumination to the minimum criteria values herein specified.

Exception: Automatic, motion sensor-type lighting switches shall be permitted within the means of egress, provided that the switch controllers are equipped for fail-safe operation, the illumination timers are set for a minimum 15-minute duration, and the motion sensor is activated by any occupant movement in the area served by the lighting units. (101:7.8.1.2)

4-7* Emergency Lighting.

4-7.1 Emergency lighting facilities for means of egress shall be provided in accordance with Section 7.9 of NFPA 101 for the following:

- (1) Buildings or structures where required in Chapters 11 through 42 of NFPA 101
- (2) Underground and windowless structures as addressed in Section 11.7 of NFPA 101
- (3) High-rise buildings as required by other sections of this Code
- (4) Doors equipped with delayed egress locks
- (5) The stair shaft and vestibule of smokeproof enclosures, which shall be permitted to include a standby generator that is installed for the smokeproof enclosure mechanical ventilation equipment and used for the stair shaft and vestibule emergency lighting power supply

For the purposes of this requirement, exit access shall include only designated stairs, aisles, corridors, ramps, escalators, and passageways leading to an exit. For the purposes of this requirement, exit discharge shall include only designated stairs, ramps, aisles, walkways, and escalators leading to a public way. (101:7.9.1.1)

4-7.2 Periodic Testing of Emergency Lighting Equipment. A functional test shall be conducted on every required emergency lighting system at 30-day intervals for not less than 30 seconds. An annual test shall be conducted on every required battery-powered emergency lighting system for not less than 1½ hours. Equipment shall be fully operational for the duration of the test. Written records of visual inspections and tests shall be kept by the owner for inspection by the authority having jurisdiction.

Exception: Self-testing/self-diagnostic, battery-operated emergency lighting equipment that automatically performs a test for not less than 30 seconds and diagnostic routine not less than once every 30 days and indicates failures by a status indicator shall be exempt from the 30-day functional test, provided that a visual inspection is performed at 30-day intervals. (101:7.9.3)

4-8 Marking of Means of Egress.

4-8.1* Exits, other than main exterior exit doors that obviously and clearly are identifiable as exits, shall be marked by an approved sign readily visible from any direction of exit access. (101:7.10.1.2)

4-8.2 Access to exits shall be marked by approved, readily visible signs in all cases where the exit or way to reach the exit is not readily apparent to the occupants. Sign placement shall be such that no point in an exit access corridor is in excess of 100 ft (30 m) from the nearest externally illuminated sign and is not in excess of the marked rating for internally illuminated signs.

Exception: Signs in exit access corridors in existing buildings shall not be required to meet the placement distance requirements. (101:7.10.1.4)

4-8.3* Every sign required in Section 7.10 of NFPA 101 shall be located and of such size, distinctive color, and design that it is readily visible and shall provide contrast with decorations, interior finish, or other signs. No decorations, furnishings, or equipment that impairs visibility of a sign shall be permitted. No brightly illuminated sign (for other than exit purposes), display, or object in or near the line of vision of the required exit sign that could detract attention from the exit sign shall be permitted. (101:7.10.1.7)

4-8.4 Size of Signs.

4-8.4.1* Externally illuminated signs required by 7.10.1 and 7.10.2 of NFPA 101, other than approved existing signs, shall have the word EXIT or other appropriate wording in plainly legible letters not less than 6 in. (15.2 cm) high with the principal strokes of letters not less than ¾ in. (1.9 cm) wide. The word EXIT shall have letters of a width not less than 2 in. (5 cm), except the letter I, and the minimum spacing between letters shall be not less than ⅜ in. (1 cm). Signs larger than the minimum established in this paragraph shall have letter widths, strokes, and spacing in proportion to their height.

Exception No. 1: This requirement shall not apply to existing signs having the required wording in plainly legible letters not less than 4 in. (10.2 cm) high.

Exception No. 2: This requirement shall not apply to marking required by 7.10.1.3 and 7.10.1.5 of NFPA 101. (101:7.10.6.1)

4-8.4.2* Internally illuminated signs, other than approved existing signs, or existing signs having the required wording in legible letters not less than 4 in. (10.2 cm) high, shall be listed in accordance with UL 924, *Standard for Safety Emergency Lighting and Power Equipment*.

Exception: This requirement shall not apply to signs that are in accordance with 7.10.1.3 and 7.10.1.5 of NFPA 101. (101:7.10.7.1)

4-8.5* Illumination of Signs.

4-8.5.1* Every sign required by 4-8.1 or 4-8.2, other than where operations or processes require low lighting levels, shall be suitably illuminated by a reliable light source. Externally and internally illuminated signs shall be legible in both the normal and emergency lighting mode. (101:7.10.5.1)

4-8.5.2* Every sign required to be illuminated by 7.10.6.3 and 7.10.7 of NFPA 101 shall be continuously illuminated as required under the provisions of Section 7.8 of NFPA 101.

Exception: Illumination for signs shall be permitted to flash on and off upon activation of the fire alarm system. (101:7.10.5.2)

4-8.5.3 Where emergency lighting facilities are required by the applicable provisions of Chapters 11 through 42 of NFPA 101 for individual occupancies, the signs, other than approved self-luminous signs, shall be illuminated by the emergency lighting facilities. The level of illumination of the signs shall be in accordance with 7.10.6.3 or 7.10.7 of NFPA 101 for the required emergency lighting duration as specified in 7.9.2.1 of NFPA 101. However, the level of illumination shall be permitted to decline to 60 percent at the end of the emergency lighting duration. (101:7.10.4)

4-8.5.4* Photoluminescent Signs. The face of a photoluminescent sign shall be continually illuminated while the building is occupied. The illumination levels on the face of the photoluminescent sign shall be in accordance with its listing. The charging illumination shall be a reliable light source as determined by the authority having jurisdiction. The charging light source shall be of a type specified in the product markings. (101:7.10.7.2)

4-8.6 Specific Requirements.

4-8.6.1 Directional Signs.

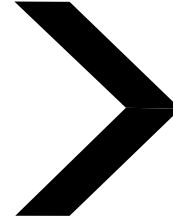
4-8.6.1.1* A sign complying with 7.10.3 of NFPA 101 with a directional indicator showing the direction of travel shall be placed in every location where the direction of travel to reach the nearest exit is not apparent. (101:7.10.2)

4-8.6.1.2* The directional indicator shall be located outside of the EXIT legend, not less than $\frac{3}{8}$ in. (1 cm) from any letter. The directional indicator shall be of a chevron type, as shown in Figure 4-8.6.1.2. The directional indicator shall be identifiable as a directional indicator at a distance of 40 ft (12.2 m). A directional indicator larger than the minimum established in this

paragraph shall be proportionately increased in height, width and stroke. The directional indicator shall be located at the end of the sign for the direction indicated.

Exception: This requirement shall not apply to approved existing signs. (101:7.10.6.2)

FIGURE 4-8.6.1.2 Chevron-type indicator. (101:Figure 7.10.6.2)



4-8.6.2* Special Signs. Any door, passage, or stairway that is neither an exit nor a way of exit access and that is located or arranged so that it is likely to be mistaken for an exit shall be identified by a sign that reads as follows:

NO
EXIT

Such sign shall have the word NO in letters 2 in. (5 cm) high with a stroke width of $\frac{3}{8}$ in. (1 cm) and the word EXIT in letters 1 in. (2.5 cm) high, with the word EXIT below the word NO.

Exception: This requirement shall not apply to approved existing signs. (101:7.10.8.1)

4-9 Means of Egress Reliability.

4-9.1* Means of egress shall be continuously maintained free of all obstructions or impediments to full instant use in the case of fire or other emergency. (101:7.1.10.1)

4-9.2 Furnishings and Decorations in Means of Egress.

4-9.2.1 No furnishings, decorations, or other objects shall obstruct exits, access thereto, egress therefrom, or visibility thereof. (101:7.1.10.2.1)

4-9.2.2 There shall be no obstructions by railings, barriers, or gates that divide the open space into sections appurtenant to individual rooms, apartments, or other occupied spaces. Where the authority having jurisdiction finds the required path of travel to be obstructed by furniture or other movable objects, the authority shall be permitted to require that such objects be secured out of the way or shall be permitted to require that railings or other permanent barriers be installed to protect the path of travel against encroachment. (101:7.1.10.2.2)

4-9.2.3 Mirrors shall not be placed on exit doors. Mirrors shall not be placed in or adjacent to any exit in such a manner as to confuse the direction of egress. (101:7.1.10.2.3)

Chapter 5 Features of Fire Protection

5-1 General. This chapter shall apply to new, existing, permanent, or temporary buildings.

5-2 Construction. Where required by this Code, a type of building construction shall comply with NFPA 220, *Standard on Types of Building Construction*.

5-3 Fire-Resistant Assemblies. The design and construction of fire walls and fire barrier walls that are required to separate buildings or subdivide a building to prevent the spread of fire shall comply with this section and NFPA 221, *Standard for Fire Walls and Fire Barrier Walls*.

5-4 Fire Doors and Windows.

5-4.1 The installation and maintenance of assemblies and devices used to protect openings in walls, floors, and ceilings against the spread of fire and smoke within, into, or out of buildings shall comply with this section and NFPA 80, *Standard for Fire Doors and Fire Windows*.

5-4.2 The fire performance evaluation of these assemblies shall be in accordance with NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*, for horizontal access doors; NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*, for fire doors and shutters; and NFPA 257, *Standard on Fire Test for Window and Glass Block Assemblies*, for fire windows and glass block.

5-4.3* This section shall not apply to incinerator doors, record room doors, and vault doors.

5-4.4 This section shall not apply to fire-resistant glazing materials and horizontally sliding accordion or folding assemblies fabricated for use as walls and tested as wall assemblies in accordance with NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*. The authority having jurisdiction shall be consulted for the design and installation of such materials and assemblies. (80:1-1.4)

5-5 Interior Finish. Interior finish in buildings and structures shall meet the requirements of NFPA 101, *Life Safety Code*, and this Code.

5-6 Furnishings, Contents, Decorations, and Treated Finishes. Furnishings, contents, decorations, and treated finishes in buildings and structures shall meet the requirements of NFPA 101, *Life Safety Code*, and this Code.

5-7 Smoke Partitions.

5-7.1 Where required elsewhere in this Code or NFPA 101, smoke partitions shall be provided to limit the transfer of smoke. (101:8.2.4.1)

5-7.2 Smoke partitions shall extend from the floor to the underside of the floor or roof deck above, through any concealed spaces, such as those above suspended ceilings, and through interstitial structural and mechanical spaces.

*Exception:** Smoke partitions shall be permitted to terminate at the underside of a monolithic or suspended ceiling system where the following conditions are met:

- (a) The ceiling system forms a continuous membrane.

- (b) A smoketight joint is provided between the top of the smoke partition and the bottom of the suspended ceiling.

- (c) The space above the ceiling is not used as a plenum. (101:8.2.4.2)

5-7.3* Doors.

5-7.3.1 Doors in smoke partitions shall comply with 5-7.3.2 through 5-7.3.5. (101:8.2.4.3.1)

5-7.3.2 Doors shall comply with the provisions of 7.2.1 of NFPA 101. (101:8.2.4.3.2)

5-7.3.3 Doors shall not include louvers. (101:8.2.4.3.3)

5-7.3.4* Door clearances shall be in accordance with NFPA 80, *Standard for Fire Doors and Fire Windows*. (101:8.2.4.3.4)

5-7.3.5 Doors shall be self-closing or automatic-closing in accordance with 7.2.1.8 of NFPA 101. (101:8.2.4.3.5)

5-7.4 Penetrations and Miscellaneous Openings in Smoke Partitions.

5-7.4.1 Pipes, conduits, bus ducts, cables, wires, air ducts, pneumatic tubes and ducts, and similar building service equipment that pass through smoke partitions shall be protected as follows:

- (1) The space between the penetrating item and the smoke partition shall meet one of the following conditions:
 - a. It shall be filled with a material that is capable of limiting the transfer of smoke.
 - b. It shall be protected by an approved device that is designed for the specific purpose.
- (2) Where the penetrating item uses a sleeve to penetrate the smoke partition, the sleeve shall be solidly set in the smoke partition, and the space between the item and the sleeve shall meet one of the following conditions:
 - a. It shall be filled with a material that is capable of limiting the transfer of smoke.
 - b. It shall be protected by an approved device that is designed for the specific purpose.
- (3) Where designs take transmission of vibrations into consideration, any vibration isolation shall meet one of the following conditions:
 - a. It shall be made on either side of the smoke partitions.
 - b. It shall be made by an approved device that is designed for the specific purpose. (101:8.2.4.4.1)

5-7.4.2 Openings located at points where smoke partitions meet the outside walls, other smoke partitions, smoke barriers, or fire barriers of a building shall meet one of the following conditions:

- (1) They shall be filled with a material that is capable of limiting the transfer of smoke.
- (2) They shall be made by an approved device that is designed for the specific purpose. (101:8.2.4.4.2)

5-7.4.3* Air transfer openings in smoke partitions shall be provided with approved dampers designed to limit the transfer of smoke. Dampers in air transfer openings shall close upon detection of smoke by approved smoke detectors installed in accordance with NFPA 72, *National Fire Alarm Code*. (101:8.2.4.4.3)

Chapter 6 Building Services

6-1 Electrical Fire Safety.

6-1.1 This section shall apply to new, existing, permanent, or temporary electrical appliances, equipment, fixtures, or wiring.

Exception: Existing installations shall be permitted to be continued in use provided the lack of conformity does not present an imminent hazard danger.

6-1.2 All electrical appliances, fixtures, equipment, or wiring shall be installed and maintained in accordance with NFPA 70, *National Electrical Code*®.

6-1.3 Permanent wiring shall be installed and maintained in accordance with NFPA 70, *National Electrical Code*.

6-1.4 Permanent wiring abandoned in place shall be tagged or otherwise identified at its termination and junction points as “Abandoned in Place” or removed from all accessible areas and insulated from contact with other live electrical wiring or devices.

6-1.5 Extension cords shall not be used as a substitute for permanent wiring.

6-2 Heating, Ventilation, and Air Conditioning.

6-2.1 Air-conditioning, heating, and ventilating ductwork and related equipment shall be installed in accordance with NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, or NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*, as applicable.

Exception: Existing installations shall be permitted to be continued in service, subject to approval by the authority having jurisdiction.

6-2.2 Ventilating or heat-producing equipment shall be installed in accordance with NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids*; NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*; NFPA 31, *Standard for the Installation of Oil-Burning Equipment*; NFPA 54, *National Fuel Gas Code*; or NFPA 70, *National Electrical Code*, as applicable.

Exception: Existing installations shall be permitted to be continued in service, subject to approval by the authority having jurisdiction.

6-2.3 Ventilating systems in laboratories using chemicals shall be installed in accordance with NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*, or NFPA 99, *Standard for Health Care Facilities*, as appropriate.

6-3 Elevators, Escalators, and Conveyors.

6-3.1 Fire Fighters’ Service.

6-3.1.1 All new elevators shall conform to the Fire Fighters’ Service Requirements of ASME/ANSI A17.1, *Safety Code for Elevators and Escalators*. (101:9.4.3.1)

6-3.1.2 All existing elevators having a travel distance of 25 ft (7.6 m) or more above or below the level that best serves the needs of emergency personnel for fire fighting or rescue purposes shall conform to the Fire Fighters’ Service Requirements of ASME/ANSI A17.3, *Safety Code for Existing Elevators and Escalators*. (101:9.4.3.2)

6-3.2 Elevator Testing. Elevators shall be subject to routine and periodic inspections and tests as specified in ASME/ANSI A17.1, *Safety Code for Elevators and Escalators*. All elevators equipped with fire fighter service in accordance with 6-3.1.1

and 6-3.1.2 shall be subject to a monthly operation with a written record of the findings made and kept on the premises as required by ASME/ANSI A17.1, *Safety Code for Elevators and Escalators*. (101:9.4.6)

6-3.3 Openings. Conveyors, elevators, dumbwaiters, and pneumatic conveyors serving various stories of a building shall not open to an exit. (101:9.4.7)

6-4 Utilities. Equipment using fuel gas and related gas piping shall be installed in accordance with NFPA 54, *National Fuel Gas Code*, or NFPA 58, *Liquefied Petroleum Gas Code*.

Exception: Existing installations shall be permitted to be continued in service, subject to approval by the authority having jurisdiction.

6-5 Heating Appliances.

6-5.1 General.

6-5.1.1 The installation of liquid fuel-fired heating appliances shall comply with this chapter and NFPA 31, *Standard for the Installation of Oil-Burning Equipment*.

6-5.1.2 The installation of gas-fired heating appliances shall comply with this chapter and NFPA 54, *National Fuel Gas Code*. (See Chapter 21 for LP-Gas fuel supply and storage installations.)

6-5.1.3 This chapter shall not apply to internal combustion engines, oil lamps, or portable devices not otherwise covered in this Code or NFPA 31, *Standard for the Installation of Oil-Burning Equipment*, such as blow torches, melting pots, and weed burners. (See Chapter 5 of NFPA 31 for portable devices that are covered.) (31:1-1.3)

6-5.1.4 All heating appliances shall be approved or listed.

6-5.1.5 Permits. Permits, where required, shall comply with Section 1-16.

6-5.1.6 Electrical wiring and equipment used in connection with oil-burning equipment shall be installed in accordance with NFPA 70, *National Electrical Code*. (31:1-13.1)

6-5.1.7 The grade of fuel oil used in a burner shall be that for which the burner is approved and as stipulated by the manufacturer. Crankcase oil or any oil containing gasoline shall not be used. For use of oil fuels other than those defined herein, see Section 1-3 of NFPA 31.

Exception: Where acceptable to the authority having jurisdiction, oil-burning equipment designed to burn crankcase oil shall be permitted to be used in commercial or industrial occupancies. Such oil-burning equipment shall be listed for use with crankcase oils and shall be installed in accordance with the manufacturers’ instructions and the terms of their listing. (See Section 1-16 of NFPA 31.) (31:1-15.1)

6-5.2 Kerosene Burners and Oil Stoves.

6-5.2.1 Kerosene burners and oil stoves shall be equipped with a primary safety control furnished as an integral part of the appliance by the manufacturer to stop the flow of oil in the event of flame failure. Barometric oil feed shall not be considered a primary safety control.

6-5.2.2 A conversion range oil burner shall be equipped with a thermal (heat actuated) valve in the oil supply line, located in the burner compartment of the stove.

6-5.2.3 Only listed kerosene heaters shall be used. The following safeguards shall apply:

- (1) Provide adequate ventilation.
- (2) Do not place on carpeting.

- (3) Keep 3 ft (0.9 m) away from combustible furnishings or drapes.
- (4) Use only approved Type 1-K water clear kerosene.
- (5) Allow to cool before refueling.

6-5.3 Portable Electric Heater.

6-5.3.1 The authority having jurisdiction shall be permitted to prohibit use of portable electric heaters in occupancies or situations where such use or operation would present an undue danger to life or property.

6-5.3.2 Portable electric heaters shall be designed and located so that they cannot be easily overturned.

6-5.3.3 All portable electric heaters shall be listed.

6-5.4 Vents. All chimneys, smokestacks, or similar devices for conveying smoke or hot gases to the outer air and the stoves, furnaces, incinerators, boilers, or any other heat-producing devices or appliances shall be installed and maintained in accordance with NFPA 54, *National Fuel Gas Code*, and NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*.

6-6 Rubbish Chutes, Incinerators, and Laundry Chutes.

6-6.1 Enclosure. Rubbish chutes and laundry chutes shall be separately enclosed by walls or partitions in accordance with the provisions of Section 8.2 of NFPA 101. Inlet openings serving chutes shall be protected in accordance with Section 8.2 of NFPA 101. Doors of such chutes shall open only to a room that is designed and used exclusively for accessing the chute opening. The room shall be separated from other spaces in accordance with Section 8.4 of NFPA 101.

Exception No. 1: Existing installations having properly enclosed service chutes and properly installed and maintained service openings shall be permitted to have inlets open to a corridor or normally occupied space.

Exception No. 2: Rubbish chutes and laundry chutes shall be permitted to open into rooms not exceeding 400 ft² (37 m²) in area used for storage, provided that the room is protected by automatic sprinklers. (101:9.5.1)

6-6.2 Installation and Maintenance. Rubbish chutes, laundry chutes, and incinerators shall be installed and maintained in accordance with NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment*, unless existing installations, which shall be permitted to be continued in service, subject to approval by the authority having jurisdiction. (101:9.5.2)

6-7 Emergency and Standby Power.

6-7.1 Emergency Generators. Emergency generators, where required for compliance with this Code, shall be tested and maintained in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems*. (101:9.1.3)

6-7.2 Stored electrical energy systems shall be maintained in accordance with NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*. (101:9.1.4)

6-8* Smoke Control. Smoke control systems, where required or permitted by this Code, shall have an approved maintenance and testing program to ensure operational integrity. The purpose of such smoke control systems shall be to confine smoke to the general area of fire origin and maintain use of the means of egress system.

Chapter 7 Fire Protection Systems

7-1 General.

7-1.1 The authority having jurisdiction shall have the authority to require that shop drawings for all fire protection systems be submitted for review and approval and a permit be issued for installation, rehabilitation, or modification. (*For additional information concerning shop drawings, see Section 1-18.*) Further, the authority having jurisdiction shall have the authority to require that full acceptance tests of the systems be performed in the authority's presence prior to final system certification.

7-1.2 The property owner shall be responsible for the proper testing and maintenance of the equipment and systems.

7-1.3 Detailed records documenting all systems and equipment testing and maintenance shall be kept by the property owner. These records shall be made available upon request for review by the authority having jurisdiction.

7-1.4 Existing systems shall be in accordance with 1-5.5 and 1-9.2.

7-2 Standpipe Systems.

7-2.1 General. The design and installation of standpipe systems shall be in accordance with this section and NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*.

7-2.2 Where Required.

7-2.2.1 Where required by this Code or the referenced codes and standards listed in Chapter 32, standpipe systems shall be installed in accordance with 7-2.1.

7-2.2.2 New buildings more than three stories in height or new buildings over 50 ft (15 m) in height above grade and containing intermediate stories or balconies shall be equipped with a standpipe system installed in accordance with the provisions of this section and NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*.

7-2.3 Inspection, Testing, and Maintenance.

7-2.3.1 A standpipe system installed in accordance with this Code shall be properly maintained to provide at least the same level of performance and protection as designed. The owner shall be responsible for maintaining the system and keeping it in good working condition.

7-2.3.2 A standpipe system installed in accordance with this Code shall be inspected, tested, and maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.

7-2.3.3 Existing Systems. Where an existing standpipe system, including yard piping and fire department connection, is modified, the new piping shall be tested in accordance with 9-4.1 of NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*. (14:9-4.3)

7-3 Automatic Sprinklers.

7-3.1 General.

7-3.1.1* Automatic sprinklers shall be installed and maintained in full operating condition, as specified for the occupancy involved in the codes or standards listed in Chapter 32. Installations shall be in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*; NFPA 13R, *Standard for the*

Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height; or NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, as appropriate.

7-3.1.2 Existing systems shall be in accordance with 1-5.5 and 1-9.2.

7-3.2 Where Required.

7-3.2.1 Where required by this Code or the referenced codes and standards listed in Chapter 32, automatic sprinkler systems shall be installed in accordance with 7-3.1.1.

7-3.2.2 Basement areas of new occupancies exceeding 2500 ft² (232.3 m²) shall be protected throughout by an approved automatic sprinkler system.

7-3.2.3 New Assembly Occupancies. Buildings containing assembly occupancies with occupant loads of more than 300 shall be protected by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101 as follows (*see also 12.1.6, 12.2.6, 12.3.2, and 12.3.6 of NFPA 101*):

- (1) Throughout the story containing the assembly occupancy
- (2) Throughout all stories below the story containing the assembly occupancy
- (3) In the case of an assembly occupancy located below the level of exit discharge, throughout all stories intervening between that story and the level of exit discharge, including the level of exit discharge

Exception No. 1: This requirement shall not apply to assembly occupancies used primarily for worship with fixed seating and not part of a mixed occupancy. (See 6.1.14 of NFPA 101.)

Exception No. 2: This requirement shall not apply to assembly occupancies consisting of a single multipurpose room of less than 12,000 ft² (1100 m²) that are not used for exhibition or display and are not part of a mixed occupancy.*

Exception No. 3: This requirement shall not apply to gymnasiums, skating rinks, and swimming pools used exclusively for participant sports with no audience facilities for more than 300 persons.

Exception No. 4: In stadia and arenas, sprinklers shall be permitted to be omitted over the floor area used for contest, performance, or entertainment; over the seating areas; and over open-air concourses where an approved engineering analysis substantiates the ineffectiveness of the sprinkler protection due to building height and combustible loading.

Exception No. 5: In unenclosed stadia and arenas, sprinklers shall be permitted to be omitted in the following areas:

- (a) Press boxes less than 1000 ft² (93 m²)
- (b) Storage facilities less than 1000 ft² (93 m²) if enclosed with not less than 1-hour fire resistance-rated construction
- (c) Enclosed areas underneath grandstands that comply with 31-5.5 (101:12.3.5)

7-3.2.4 Existing Assembly Occupancies. Any assembly occupancy used or capable of being used for exhibition or display purposes shall be protected throughout by an approved automatic sprinkler system in accordance with Section 9.7 of NFPA 101 where the exhibition or display area exceeds 15,000 ft² (1400 m²).

Exception No. 1: In stadia and arenas, sprinklers shall be permitted to be omitted over the floor area used for contest, performance, or entertainment, over the seating areas, and over open-air concourses where an approved engineering analysis substantiates the ineffectiveness of the sprinkler protection.

ness of the sprinkler protection due to building height and combustible loading.

Exception No. 2: In unenclosed stadia and arenas, sprinklers shall be permitted to be omitted in the following areas:

- (a) Press boxes less than 1000 ft² (93 m²)
- (b) Storage facilities less than 1000 ft² (93 m²) where enclosed with not less than 1-hour fire resistance-rated construction
- (c) Enclosed areas underneath grandstands that comply with 31-6.5 (101:13.3.5.1)

7-3.2.5 New Educational Occupancies.

7-3.2.5.1 Every portion of educational buildings below the level of exit discharge shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101. (101:14.3.5.1)

7-3.2.5.2 Buildings with unprotected openings in accordance with 8.2.5.5 of NFPA 101 shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101. (101:14.3.5.2)

7-3.2.6 Existing Educational Occupancies.

7-3.2.6.1 Wherever student occupancy exists below the level of exit discharge, every portion of such floor shall be protected throughout by an approved automatic sprinkler system in accordance with Section 9.7 of NFPA 101. Where student occupancy does not exist on floors below the level of exit discharge, such floors shall be separated from the rest of the building by 1-hour fire resistance-rated construction or shall be protected throughout by an approved automatic sprinkler system in accordance with Section 9.7 of NFPA 101.

Exception: Where student occupancy exists below the level of exit discharge, automatic sprinkler protection shall not be required, subject to the approval of the authority having jurisdiction, where windows for rescue and ventilation are provided in accordance with 15.2.11.1 of NFPA 101. (101:15.3.5.1)

7-3.2.6.2 Buildings with unprotected openings in accordance with 8.2.5.5 of NFPA 101 shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101. (101:15.3.5.2)

7-3.2.7 New Health Care Occupancies.

7-3.2.7.1* Buildings containing health care facilities shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101.

Exception: In Type I and Type II construction, where approved by the authority having jurisdiction, alternative protection measures shall be permitted to be substituted for sprinkler protection in specified areas where the authority having jurisdiction has prohibited sprinklers, without causing a building to be classified as nonsprinklered. (101:18.3.5.1)

7-3.2.7.2* Listed quick-response or listed residential sprinklers shall be used throughout smoke compartments containing patient sleeping rooms. (101:18.3.5.2)

7-3.2.7.3* Sprinklers in areas where cubicle curtains are installed shall be in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*. (101:18.3.5.5)

7-3.2.8 Existing Health Care Occupancies.

7-3.2.8.1 Where required by 19.1.6 of NFPA 101, health care facilities shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101.

Exception: In Type I and Type II construction, where approved by the authority having jurisdiction, alternative protection measures shall be permitted to be substituted for sprinkler protection in specified areas where the authority having jurisdiction has prohibited sprinklers, without causing a building to be classified as nonsprinklered. (101:19.3.5.1)

7-3.2.8.2* Where this Code and NFPA 101 permit exceptions for fully sprinklered buildings or smoke compartments, the sprinkler system shall meet the following criteria:

- (1) It shall be in accordance with Section 9.7 of NFPA 101.
- (2) It shall be electrically connected to the fire alarm system.
- (3) It shall be fully supervised.

Exception: In Type I and Type II construction, where approved by the authority having jurisdiction, alternative protection measures shall be permitted to be substituted for sprinkler protection in specified areas where the authority having jurisdiction has prohibited sprinklers, without causing a building to be classified as nonsprinklered. (101:19.3.5.2)

7-3.2.8.3* Where this Code and NFPA 101 permit exceptions for fully sprinklered buildings or smoke compartments and specifically references this paragraph, the sprinkler system shall meet the following criteria:

- (1) It shall be installed throughout the building in accordance with Section 9.7 of NFPA 101.
- (2) It shall be electrically connected to the fire alarm system.
- (3) It shall be fully supervised.
- (4) It shall be equipped with listed quick-response or listed residential sprinklers throughout all smoke compartments containing patient sleeping rooms.

Exception No. 1: Standard response sprinklers shall be permitted to be continued to be used in existing approved sprinkler systems where quick-response and residential sprinklers were not listed for use in such locations at the time of installation.

Exception No. 2: Standard response sprinklers shall be permitted for use in hazardous areas protected in accordance with 19.3.2.1 of NFPA 101. (101:19.3.5.3)

7-3.2.8.4 Isolated hazardous areas shall be permitted to be protected in accordance with 9.7.1.2 of NFPA 101. For new installations in existing health care occupancies, where more than two sprinklers are installed in a single area, waterflow detection shall be provided to sound the building fire alarm, or to notify by a signal, any constantly attended location, such as PBX, security, or emergency room, at which the necessary corrective action shall be taken. (101:19.3.5.4)

7-3.2.8.5* Newly introduced cubicle curtains in sprinklered areas shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*. (101:19.3.5.5)

7-3.2.9 New Detention and Correction Facilities.

7-3.2.9.1 All buildings classified as Use Condition II, Use Condition III, Use Condition IV, or Use Condition V shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101. (101:22.3.5.2)

7-3.2.9.2 The automatic sprinkler system required by 7-3.2.9.1 shall be as follows:

- (1) In accordance with Section 9.7 of NFPA 101
- (2) Electrically connected to the fire alarm system
- (3) Fully supervised (101:22.3.5.3)

7-3.2.10 Existing Detention and Correctional Facilities.

7-3.2.10.1* Where required by 23.1.6 of NFPA 101, facilities shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101. (101:23.3.5.2)

7-3.2.10.2 Where this Code permits exceptions for fully sprinklered detention and correctional occupancies or sprinklered smoke compartments, the sprinkler system shall be as follows:

- (1) In accordance with Section 9.7 of NFPA 101
- (2) Electrically connected to the fire alarm system
- (3) Fully supervised (101:23.3.5.3)

7-3.2.11 New Hotels and Dormitories.

7-3.2.11.1 Where an automatic sprinkler system is installed, either for total or partial building coverage, the system shall be in accordance with Section 9.7 of NFPA 101. In buildings up to and including four stories in height, systems in accordance with NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, shall be permitted.

Exception: The provisions for draft stops and closely spaced sprinklers in NFPA 13, *Standard for the Installation of Sprinkler Systems*, shall not be required for openings complying with 8.2.5.8 of NFPA 101 where the opening is within the guest room or guest suite. (101:28.3.5.1)

7-3.2.11.2 All buildings shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with 7-3.2.11.1.

Exception: Buildings other than high-rise buildings, where all guest sleeping rooms have a door that opens directly to the outside at street or ground level, or to exterior exit access arranged in accordance with 7.5.3 of NFPA 101. (101:28.3.5.2)

7-3.2.11.3 Listed quick-response or listed residential sprinklers shall be used throughout guest rooms and guest room suites. (101:28.3.5.3)

7-3.2.11.4 Open parking structures complying with NFPA 88A, *Standard for Parking Structures*, that are contiguous with hotels or dormitories shall be exempt from the sprinkler requirements of 7-3.2.11.2. (101:28.3.5.4)

7-3.2.12 Existing Hotels and Dormitories.

7-3.2.12.1* Where an automatic sprinkler system is installed, either for total or partial building coverage, the system shall be in accordance with Section 9.7 of NFPA 101. In buildings up to and including four stories in height, systems in accordance with NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, shall be permitted.

Exception No. 1: The provisions for draft stops and closely spaced sprinklers in NFPA 13, *Standard for the Installation of Sprinkler Systems*, shall not be required for openings complying with 8.2.5.8 of NFPA 101 where the opening is within the guest room or guest suite.

Exception No. 2: In guest rooms and in guest room suites, sprinkler installations shall not be required in closets not exceeding 24 ft² (2.2 m²) and in bathrooms not exceeding 55 ft² (5.1 m²). (101:29.3.5.1)

7-3.2.12.2 All high-rise buildings shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with 7-3.2.12.1.

Exception: Where each guest room or guest suite has exterior exit access in accordance with 7.5.3 of NFPA 101. (101:29.3.5.2)

7-3.2.13 New Apartment Buildings.

7-3.2.13.1 Where an automatic sprinkler system is installed, either for total or partial building coverage, the system shall be in accordance with Section 9.7 of NFPA 101. In buildings up to and including four stories in height, systems in accordance with NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, shall be permitted.

Exception No. 1: In buildings sprinklered in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, closets less than 12 ft² (1.1 m²) in area in individual dwelling units shall not be required to be sprinklered. Closets that contain equipment such as washers, dryers, furnaces, or water heaters shall be sprinklered regardless of size.

Exception No. 2: The provisions for draft stops and closely spaced sprinklers in NFPA 13, *Standard for the Installation of Sprinkler Systems*, shall not be required for openings complying with 8.2.5.8 of NFPA 101 where the opening is within the dwelling unit. (101:30.3.5.1)

7-3.2.13.2 All buildings shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with 7-3.2.13.1.

Exception: Buildings where every dwelling unit is provided with one of the following:

- (a) An exit door opening directly to the street or yard at ground level
- (b) Direct access to an outside stair complying with 7.2.2 of NFPA 101 that serves not more than two units, both of which are located on the same floor
- (c) Direct access to an interior stair serving only that unit, and such stair is separated from all other portions of the building by fire barriers having a 1-hour fire resistance rating with no openings therein (101:30.3.5.2)

7-3.2.13.3 Listed quick-response or listed residential sprinklers shall be used throughout all dwelling units. (101:30.3.5.3)

7-3.2.13.4 Open parking structures complying with NFPA 88A, *Standard for Parking Structures*, that are contiguous with apartment buildings shall be exempt from the sprinkler requirements of 7-3.2.13.2. (101:30.3.5.4)

7-3.2.13.5 Buildings with unprotected openings in accordance with 8.2.5.5 of NFPA 101 shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with 30.3.5 of NFPA 101. (101:30.3.5.5)

7-3.2.14 Existing Apartment Buildings.

7-3.2.14.1* Where an automatic sprinkler system is installed, either for total or partial building coverage, the system shall be in accordance with Section 9.7 of NFPA 101. In buildings up to and including four stories in height, systems in accordance with NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, shall be permitted.

Exception No. 1: In individual dwelling units, sprinkler installation shall not be required in closets not exceeding 24 ft² (2.2 m²) and in bathrooms not exceeding 55 ft² (5.1 m²). Closets that contain equipment such as washers, dryers, furnaces, or water heaters shall be sprinklered regardless of size.

Exception No. 2: The provisions for draft stops and closely spaced sprinklers in NFPA 13, *Standard for the Installation of Sprinkler Sys-*

tems, shall not be required for openings complying with 8.2.5.8 of NFPA 101 where the opening is within the dwelling unit. (101:31.3.5.1)

7-3.2.14.2 Buildings using Option 3 of 31.1.1.1 of NFPA 101 shall be provided with the following:

- (1) Automatic sprinklers in the corridor along the corridor ceiling
- (2) An automatic sprinkler within any dwelling unit that has a door opening to the corridor, with such sprinkler positioned over the center of the door

Exception: The sprinkler inside dwelling units shall not be required if the door to the dwelling unit has not less than a 20-minute fire protection rating and is self-closing. (101:31.3.5.2)

7-3.2.14.3 The sprinkler installation required in 7-3.2.14.2 shall meet the requirements of Section 9.7 of NFPA 101 in terms of workmanship and materials. (101:31.3.5.3)

7-3.2.14.4 The installation of the corridor sprinklers required in 7-3.2.14.2 shall not exceed the maximum spacing and protection area requirements of the installation standards referenced in Section 9.7 of NFPA 101. (101:31.3.5.4)

7-3.2.14.5 Buildings using Option 4 of 31.1.1.1 of NFPA 101 shall be protected throughout by an approved automatic sprinkler system in accordance with 7-3.2.14.1. The automatic sprinkler system shall meet the requirements of Section 9.7 of NFPA 101 for supervision for buildings more than six stories in height. (101:31.3.5.5)

7-3.2.14.6 All high-rise buildings shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with 7-3.2.14.1.

Exception No. 1: Where every dwelling unit has exterior exit access in accordance with 7.5.3 of NFPA 101.

*Exception No. 2:** Buildings in which an engineered life safety system has been approved by the authority having jurisdiction. (101:31.3.5.6)

7-3.2.15 Lodging and Rooming Houses.

7-3.2.15.1* Where an automatic sprinkler system is required or is used as an alternative method of protection, either for total or partial building coverage, the system shall be in accordance with Section 9.7 of NFPA 101 and shall actuate the fire alarm system in accordance with Section 9.6 of NFPA 101. In buildings up to and including four stories in height, systems in accordance with NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, shall be permitted. The use of NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, shall be permitted where the lodging or rooming house is not part of a mixed occupancy. Entrance foyers shall be sprinklered. Lodging and rooming houses with sleeping accommodations for more than eight occupants shall be treated as two-family dwellings with regard to the water supply.

Exception No. 1: In buildings sprinklered in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, closets less than 12 ft² (1.1 m²) in area in individual dwelling units shall not be required to be sprinklered. Closets that contain equipment such as washers, dryers, furnaces, or water heaters shall be sprinklered regardless of size.

Exception No. 2: In existing lodging and rooming houses, sprinkler installations shall not be required in closets not exceeding 24 ft² (2.2 m²) and in bathrooms not exceeding 55 ft² (5.1 m²). (101:26.3.5.1)

7-3.2.15.2 All new lodging or rooming houses shall be protected throughout by an approved automatic sprinkler system in accordance with 7-3.2.15.1.

Exception: Where every sleeping room has a door opening directly to the outside of the building at street or ground level, or has a door opening directly to the outside leading to an exterior stairway that meets the requirements of 26.2.1.1 of NFPA 101. (101:26.3.5.2)

7-3.2.16 New Residential Board and Care Facilities.

7-3.2.16.1 Large Facilities.

7-3.2.16.1.1* All buildings shall be protected throughout by an approved automatic sprinkler system in accordance with Section 9.7 of NFPA 101. Quick-response or residential sprinklers shall be provided throughout.

Exception No. 1: In buildings not more than four stories in height, a sprinkler system complying with NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, shall be permitted.

Exception No. 2: Automatic sprinklers shall not be required in small clothes closets where the smallest dimension does not exceed 3 ft (0.9 m), the area does not exceed 24 ft² (2.2 m²), and the walls and ceiling are finished with noncombustible or limited-combustible materials.

Exception No. 3: Standard response sprinklers shall be permitted for use in hazardous areas in accordance with 32.3.3.2 of NFPA 101. (101:32.3.3.5.1)

7-3.2.16.1.2 Automatic sprinkler systems shall be supervised in accordance with Section 9.7 of NFPA 101. (101:32.3.3.5.3)

7-3.2.16.2 Small Facilities.

7-3.2.16.2.1 All facilities shall be protected throughout by an approved automatic sprinkler system in accordance with 7-3.2.16.2.2. Quick-response or residential sprinklers shall be provided.

Exception No. 1: In conversions, sprinklers shall not be required in small board and care homes with a rating of prompt evacuation capability and serving eight or fewer residents.

Exception No. 2: Standard response sprinklers shall be permitted for use in hazardous areas in accordance with 32.2.3.2 of NFPA 101. (101:32.2.3.5.1)

7-3.2.16.2.2* Where an automatic sprinkler system is installed, for either total or partial building coverage, the system shall be in accordance with Section 9.7 of NFPA 101 and shall initiate the fire alarm system in accordance with 32.2.3.4.1 of NFPA 101. The adequacy of the water supply shall be documented to the authority having jurisdiction.

*Exception No. 1:** In prompt evacuation capability facilities, an automatic sprinkler system in accordance with NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, shall be permitted. Facilities with more than eight residents shall be treated as two-family dwellings with regard to water supply. Additionally, entrance foyers shall be sprinklered.

Exception No. 2: In slow and impractical evacuation capability facilities, an automatic sprinkler system in accordance with NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, with a 30-minute water supply, shall be permitted. All habitable areas and closets shall be

sprinklered. Facilities with more than eight residents shall be treated as two-family dwellings with regard to water supply.

Exception No. 3: In prompt and slow evacuation capability facilities, where an automatic sprinkler system is in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, automatic sprinklers shall not be required in closets not exceeding 24 ft² (2.2 m²) and in bathrooms not exceeding 55 ft² (5.1 m²), provided that such spaces are finished with lath and plaster or material providing a 15-minute thermal barrier.

Exception No. 4: In prompt and slow evacuation capability facilities up to and including four stories in height, systems in accordance with NFPA 13R, Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height, shall be permitted.

Exception No. 5: In impractical evacuation capability facilities up to and including four stories in height, systems in accordance with NFPA 13R, Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height, shall be permitted. All habitable areas and closets shall be sprinklered.

Exception No. 6: Initiation of the fire alarm system shall not be required for existing installations in accordance with 7-3.2.16.2.5. (101:32.2.3.5.2)

7-3.2.16.2.3 Automatic sprinkler systems installed in prompt and slow evacuation capability facilities shall have valve supervision by one of the following methods:

- (1) A single listed control valve that shuts off both domestic and sprinkler systems and a separate shutoff for the domestic system only
- (2) Central station, proprietary, or remote station alarm in accordance with Section 9.6 of NFPA 101
- (3) Valve closure that causes the sounding of an audible signal in the facility (101:32.2.3.5.3)

7-3.2.16.2.4 Automatic sprinkler systems installed in impractical evacuation capability facilities shall be supervised in accordance with Section 9.7 of NFPA 101. (101:32.2.3.5.4)

7-3.2.16.2.5 Sprinkler piping serving not more than six sprinklers for any isolated hazardous area shall be permitted to be installed in accordance with 9.7.1.2 of NFPA 101. In new installations, where more than two sprinklers are installed in a single area, waterflow detection shall be provided to initiate the fire alarm system required by 7-7.2.15.1.1. Duration of water supplies shall be as required for the sprinkler systems addressed in 7-3.2.16.2.2. (101:32.2.3.5.5)

7-3.2.17 Existing Residential Board and Care Facilities.

7-3.2.17.1 Large Facilities.

7-3.2.17.1.1* Where an automatic sprinkler system is installed either for total or partial building coverage, the system shall be installed in accordance with Section 9.7 of NFPA 101.

Exception No. 1: In buildings not more than four stories in height, a sprinkler system complying with NFPA 13R, Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height, shall be permitted.

Exception No. 2: Automatic sprinklers shall not be required in closets not exceeding 24 ft² (2.2 m²) and in bathrooms not exceeding 55 ft² (5.1 m²), provided that such spaces are finished with lath and plaster or materials with a 15-minute thermal barrier.

Exception No. 3: Initiation of the fire alarm system shall not be required for existing installations in accordance with 7-3.2.17.1.4. (101:33.3.3.5.1)

7-3.2.17.1.2 All high-rise buildings shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101. Such systems shall initiate the fire alarm system in accordance with Section 9.6 of NFPA 101.

Exception: Automatic sprinklers shall not be required in small clothes closets where the smallest dimension does not exceed 3 ft (0.9 m), the area does not exceed 24 ft² (2.2 m²), and the walls and ceiling are finished with noncombustible or limited-combustible materials. (101:33.3.3.5.2)

7-3.2.17.1.3 Automatic sprinkler systems shall be supervised in accordance with Section 9.7 of NFPA 101. Waterflow alarms shall not be required to be transmitted off-site. (101:33.3.3.5.3)

7-3.2.17.1.4 Sprinkler piping serving not more than six sprinklers for any isolated hazardous area in accordance with 9.7.1.2 of NFPA 101 shall be permitted. In new installations where more than two sprinklers are installed in a single area, waterflow detection shall be provided to initiate the fire alarm system required by 7-7.2.16.2.1. (101:33.3.3.5.4)

7-3.2.17.2 Small Facilities.

7-3.2.17.2.1* Where an automatic sprinkler system is installed, for either total or partial building coverage, the system shall be in accordance with Section 9.7 of NFPA 101 and shall activate the fire alarm system in accordance with 7-7.2.16.1.1 of NFPA 101. The adequacy of the water supply shall be documented to the authority having jurisdiction.

Exception No. 1: In prompt evacuation capability facilities, an automatic sprinkler system in accordance with NFPA 13D, Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes, shall be permitted. Automatic sprinklers shall not be required in closets not exceeding 24 ft² (2.2 m²) and in bathrooms not exceeding 55 ft² (5.1 m²), provided that such spaces are finished with lath and plaster or materials providing a 15-minute thermal barrier.

Exception No. 2: In slow and impractical evacuation capability facilities, an automatic sprinkler system in accordance with NFPA 13D, Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes, with a 30-minute water supply, shall be permitted. All habitable areas and closets shall be sprinklered. Automatic sprinklers shall not be required in bathrooms not exceeding 55 ft² (5.1 m²), provided that such spaces are finished with lath and plaster or materials providing a 15-minute thermal barrier.

Exception No. 3: In prompt and slow evacuation facilities, where an automatic sprinkler system is in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, sprinklers shall not be required in closets not exceeding 24 ft² (2.2 m²) and in bathrooms not exceeding 55 ft² (5.1 m²), provided that such spaces are finished with lath and plaster or materials providing a 15-minute thermal barrier.

Exception No. 4: In prompt and slow evacuation capability facilities up to and including four stories in height, systems installed in accordance with NFPA 13R, Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height, shall be permitted.

Exception No. 5: In impractical evacuation capability facilities up to and including four stories in height, systems installed in accordance with NFPA 13R, Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height, shall be permitted. All habitable areas and closets shall be sprinklered. Automatic sprinklers shall not be required in bathrooms not exceeding

55 ft² (5.1 m²), provided that such spaces are finished with lath and plaster or materials providing a 15-minute thermal barrier.

Exception No. 6: Initiation of the fire alarm system shall not be required for existing installations in accordance with 7-3.2.17.2.3. (101:33.2.3.5.2)

7-3.2.17.2.2 All impractical evacuation capability facilities shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with 7-3.2.17.2.1. (101:33.2.3.5.3)

7-3.2.17.2.3 Sprinkler piping serving not more than six sprinklers for any isolated hazardous area shall be permitted to be installed in accordance with 9.7.1.2 of NFPA 101. In new installations, where more than two sprinklers are installed in a single area, waterflow detection shall be provided to initiate the fire alarm system required by 7-7.2.16.1.1. Duration of water supplies shall be as required for the sprinkler systems addressed in 7-3.2.17.2.1. (101:33.2.3.5.5)

7-3.2.18 New Mercantile Occupancies.

7-3.2.18.1 Mercantile occupancies shall be protected by an approved automatic sprinkler system in accordance with Section 9.7 of NFPA 101 as follows:

- (1) Throughout all mercantile occupancies three or more stories in height
- (2) Throughout all mercantile occupancies exceeding 12,000 ft² (1115 m²) in gross area
- (3) Throughout stories below the level of exit discharge where such stories have an area exceeding 2500 ft² (230 m²) used for the sale, storage, or handling of combustible goods and merchandise
- (4) Throughout mixed occupancies in accordance with 6.1.14 of NFPA 101 where the conditions of 7-3.2.18.1(1), (2), or (3) apply to the mercantile occupancy (101:36.3.5.1)

7-3.2.18.2 Automatic sprinkler systems in Class A mercantile occupancies shall be supervised in accordance with 9.7.2 of NFPA 101. (101:36.3.5.2)

7-3.2.18.3 Bulk merchandising retail buildings shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101 and the applicable provisions of the following:

- (1) NFPA 13, *Standard for the Installation of Sprinkler Systems*
- (2) NFPA 30, *Flammable and Combustible Liquids Code*
- (3) NFPA 30B, *Code for the Manufacture and Storage of Aerosol Products*
- (4) NFPA 230, *Standard for the Fire Protection of Storage*
- (5) NFPA 231D, *Standard for Storage of Rubber Tires* (101:36.4.5.5)

7-3.2.19 Existing Mercantile Occupancies.

7-3.2.19.1 Mercantile occupancies shall be protected by an approved automatic sprinkler system in accordance with Section 9.7 of NFPA 101 as follows:

- (1) Throughout all mercantile occupancies with a story over 15,000 ft² (1400 m²) in area
- (2) Throughout all mercantile occupancies exceeding 30,000 ft² (2800 m²) in gross area
- (3) Throughout stories below the level of exit discharge where such stories have an area exceeding 2500 ft² (230 m²) used for the sale, storage, or handling of combustible goods and merchandise

- (4) Throughout mixed occupancies in accordance with 6.1.14 of NFPA 101 where the conditions of 7-3.2.19.1(1), (2), or (3) apply to the mercantile occupancy

Exception: Single-story buildings that meet the requirements of a street floor as defined in 2-1.158. (101:37.3.5.1)

7-3.2.19.2 Bulk merchandising retail buildings shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101 and the applicable provisions of the following:

- (1) NFPA 13, *Standard for the Installation of Sprinkler Systems*
- (2) NFPA 30, *Flammable and Combustible Liquids Code*
- (3) NFPA 30B, *Code for the Manufacture and Storage of Aerosol Products*
- (4) NFPA 230, *Standard for the Fire Protection of Storage*
- (5) NFPA 231D, *Standard for Storage of Rubber Tires* (101:37.4.5.5)

7-3.2.20 Underground and Windowless Structures. Where windowless or underground structures have an occupant load of more than 50 persons in the windowless or underground portions of the structure, the windowless or underground portions and all areas and floor levels traversed in traveling to the exit discharge shall be protected by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101.

Exception No. 1: This requirement shall not apply to existing windowless or underground structures with an occupant load of 100 or fewer persons in the windowless or underground portions of the structure.

Exception No. 2: This requirement shall not apply to single-story windowless structures that are permitted to have a single exit per Chapters 12 through 42 of NFPA 101 and with a common path of travel not to exceed 50 ft (15 m). (101:11.7.3.3)

7-3.2.21 High-Rise Buildings.

7-3.2.21.1 New high-rise buildings shall be protected throughout by an approved, automatic sprinkler system in accordance with this chapter.

7-3.2.21.2* Existing high-rise buildings shall be protected throughout by an approved, automatic sprinkler system in accordance with this chapter and 7-3.2.21.2.1 and 7-3.2.21.2.2.

7-3.2.21.2.1 Each building owner shall, within 180 days of receiving notice, file an intent to comply with this regulation with the authority having jurisdiction for approval. The authority having jurisdiction shall review and respond to the intent to comply submittal within 60 days of receipt.

7-3.2.21.2.2 The entire building shall be required to be protected by an approved, automatic sprinkler system within 12 years of adoption of this Code.

7-3.3 Inspection, Testing, and Maintenance.

7-3.3.1 A sprinkler system installed in accordance with this Code shall be properly maintained to provide at least the same level of performance and protection as designed. The owner shall be responsible for maintaining the system and keeping it in good working condition.

7-3.3.2 A sprinkler system installed in accordance with this Code shall be inspected, tested, and maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.

7-3.3.3 Notification to Supervisory Service. To avoid false alarms where a supervisory service is provided, the alarm receiving facility always shall be notified by the owner or designated representative as follows:

- (1) Before conducting any test or procedure that could result in the activation of an alarm
- (2) After such tests or procedures are concluded (25:2-1.2)

7-3.3.4 Buildings. Annually, prior to the onset of freezing weather, buildings with wet pipe systems shall be inspected to verify that windows, skylights, doors, ventilators, other openings and closures, blind spaces, unused attics, stair towers, roof houses, and low spaces under buildings do not expose water-filled sprinkler piping to freezing and to verify that adequate heat [minimum 40°F (4.4°C)] is available. (25:2-2.5)

7-3.3.5* Alarm Devices. Waterflow alarm devices including, but not limited to, mechanical water motor gongs, vane-type waterflow devices, and pressure switches that provide audible or visual signals shall be tested quarterly. (25:2-3.3)

7-3.3.6 A supply of at least six spare sprinklers shall be stored in a cabinet on the premises for replacement purposes. The stock of spare sprinklers shall be proportionally representative of the types and temperature ratings of the system sprinklers. A minimum of two sprinklers of each type and temperature rating installed shall be provided. The cabinet shall be so located that it will not be exposed to moisture, dust, corrosion, or a temperature exceeding 100°F (38°C).

Exception: Where dry sprinklers of different lengths are installed, spare dry sprinklers shall not be required, provided that a means of returning the system to service is furnished. (25:2-4.1.4)

7-3.3.7 The stock of spare sprinklers shall be as follows:

- (1) For protected facilities having under 300 sprinklers — no fewer than 6 sprinklers
- (2) For protected facilities having 300 to 1000 sprinklers — no fewer than 12 sprinklers
- (3) For protected facilities having over 1000 sprinklers — no fewer than 24 sprinklers (25:2-4.1.5)

7-3.3.8 Sprinklers protecting spray coating areas shall be protected against overspray residue. Sprinklers subject to overspray accumulations shall be protected using plastic bags having a maximum thickness of 0.003 in. (0.076 mm) or shall be protected with small paper bags. Coverings shall be replaced when deposits or residue accumulate. (25:2-4.1.7)

7-3.3.9* Sprinklers shall not be altered in any respect or have any type of ornamentation, paint, or coatings applied after shipment from the place of manufacture. (25:2-4.1.8)

7-3.3.10 Sprinklers and automatic spray nozzles used for protecting commercial-type cooking equipment and ventilating systems shall be replaced annually.

Exception: Where automatic bulb-type sprinklers or spray nozzles are used and annual examination shows no buildup of grease or other material on the sprinklers or spray nozzles, such sprinklers and spray nozzles shall not be required to be replaced. (25:2-4.1.9)

7-3.3.11* Dry Pipe Systems. Dry pipe systems shall be kept dry at all times.

Exception: During nonfreezing weather, a dry pipe system shall be permitted to be left wet if the only other option is to remove the system from service while waiting for parts or during repair activities. (25:2-4.2)

7-3.3.11.1 Air driers shall be maintained in accordance with the manufacturer's instructions. (25:2-4.2.1)

7-3.3.11.2 Compressors used in conjunction with dry pipe sprinkler systems shall be maintained in accordance with the manufacturer's instructions. (25:2-4.2.2)

7-3.3.12* Installation and Acceptance Testing. Where maintenance or repair requires the replacement of sprinkler system components affecting more than 20 sprinklers, those components shall be installed and tested in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*. (25:2-4.3)

7-3.4 Water Supply.

7-3.4.1 Sprinkler piping serving not more than six sprinklers for any isolated hazardous area shall be permitted to be connected directly to a domestic water supply system having a capacity sufficient to provide 0.15 gpm/ft² (6.1 L/min•m²) of floor area throughout the entire enclosed area. An indicating shutoff valve shall be installed in an accessible location between the sprinklers and the connection to the domestic water supply. (101:9.7.1.2)

7-3.4.2 Valves on connections to water supplies, sectional control and isolation valves, and other valves in supply pipes to sprinklers and other fixed water-based fire suppression systems shall be supervised by one of the following methods:

- (1) Central station, proprietary, or remote station signaling service
- (2) Local signaling service that will cause the sounding of an audible signal at a constantly attended point
- (3) Valves locked in the correct position
- (4) Valves located within fenced enclosures under the control of the owner, sealed in the open position, and inspected weekly as part of an approved procedure

Floor control valves in high-rise buildings and valves controlling flow to sprinklers in circulating closed loop systems shall comply with 7-3.4.2(1) or (2).

Exception: Supervision of underground gate valves with roadway boxes shall not be required. (13:4-15.1.1.3)

7-3.5 System Selection.

7-3.5.1 Where portions of systems are subject to freezing and temperatures cannot reliably be maintained at or above 40°F (4°C), sprinklers shall be installed as a dry pipe or preaction system.

Exception: Small unheated areas are permitted to be protected by anti-freeze systems or by other systems specifically listed for this purpose. (See 4-5.2 of NFPA 13.) (13:5-14.3.1.1)

7-3.5.2 Where aboveground water-filled supply pipes, risers, system risers, or feed mains pass through open areas, cold rooms, passageways, or other areas exposed to freezing temperatures, the pipe shall be protected against freezing by insulating coverings, frostproof casings, or other reliable means capable of maintaining a minimum temperature between 40°F (4°C) and 120°F (48.9°C). (13:5-14.3.1.2)

7-3.5.3 Dry Pipe Systems.

7-3.5.3.1 The dry pipe valve and supply pipe shall be protected against freezing and mechanical injury. (13:4-2.5.1)

7-3.5.3.2 Valve rooms shall be lighted and heated. The source of heat shall be of a permanently installed type. Heat tape shall not be used in lieu of heated valve enclosures to protect the dry pipe valve and supply pipe against freezing. (13:4-2.5.2)

7-3.6 Operating Procedures. All automatic sprinkler systems shall be continuously maintained in a reliable operating condition at all times, and such periodic inspections and tests shall be made as necessary to ensure proper maintenance. When an automatic sprinkler system is out of service for more than four hours within a 24-hour period, the building shall be evacuated, or an approved fire watch shall be provided for all portions left unprotected by the sprinkler system shutdown until the sprinkler system has been returned to service.

7-4 Fire Pumps.

7-4.1 General.

7-4.1.1 Where provided, fire pumps shall be installed in accordance with this section and NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*.

7-4.1.2 Permits. Permits, where required, shall comply with Section 1-16.

7-4.1.3* The fire pump, driver, and controller shall be protected against possible interruption of service through damage caused by explosion, fire, flood, earthquake, rodents, insects, windstorm, freezing, vandalism, and other adverse conditions. (20:2-7.1)

7-4.1.4* Application. Centrifugal pumps shall not be used where a static suction lift is required. (20:3-1.2)

7-4.1.5 Suitable means shall be provided for maintaining the temperature of a pump room or pump house, where required, above 40°F (5°C).

Exception: See 8-6.5 of NFPA 20 for higher temperature requirements for internal combustion engines. (20:2-7.2)

7-4.1.6* Temperature Maintenance. Temperature of the pump room, pump house, or area where engines are installed shall never be less than the minimum recommended by the engine manufacturer. An engine jacket water heater shall be provided to maintain 120°F (49°C). The engine manufacturer's recommendations for oil heaters shall be followed. (20:8-6.5)

7-4.1.7 Except for installations made prior to adoption of the 1974 edition of NFPA 20, dual-drive pump units shall not be used. (20:2-2.3)

7-4.1.8* Valve Supervision. Where provided, the suction valve, discharge valve, bypass valves, and isolation valves on the backflow prevention device or assembly shall be supervised open by one of the following methods:

- (1) Central station, proprietary, or remote station signaling service
- (2) Local signaling service that will cause the sounding of an audible signal at a constantly attended point
- (3) Locking valves open
- (4) Sealing of valves and approved weekly recorded inspection where valves are located within fenced enclosures under the control of the owner

Exception: The test outlet control valves shall be supervised closed. (20:2-11)

7-4.2 Workspace.

7-4.2.1 At least one entrance 24 in. (61 cm) wide and 6 1/2 ft (2 m) high shall be provided to give access to the work space around electrical equipment.

7-4.2.2 There shall be a minimum of 30 in. (76.2 cm) work space in front of the electrical equipment requiring examination, adjustment, servicing, or maintenance.

7-4.2.3 Working space shall not be used for storage.

7-4.2.4 Illumination shall be provided for all working spaces around electrical equipment requiring servicing, examination, or adjustment.

7-4.2.5 Provision shall be made for ventilation of a pump room or pump house. (20:2-7.5)

7-4.2.6* Floors shall be pitched for adequate drainage of escaping water away from critical equipment such as the pump, driver, controller, and so forth. The pump room or pump house shall be provided with a floor drain that will discharge to a frost-free location. (20:2-7.6)

7-4.3 Controllers.

7-4.3.1* Controllers shall be located as close as is practical to the engines they control and shall be within sight of the engines. (20:9-2.1)

7-4.3.2 Controllers shall be so located or so protected that they will not be injured by water escaping from pumps or pump connections. Current-carrying parts of controllers shall not be less than 12 in. (305 mm) above the floor level. (20:9-2.2)

7-4.3.3 Where the pump room is not constantly attended, audible or visible alarms powered by a source other than the engine starting batteries and not exceeding 125 V shall be provided at a point of constant attendance. These alarms shall indicate the following:

- (1) The engine is running (separate signal).
- (2) The controller main switch has been turned to the off or manual position (separate signal).
- (3) *Trouble on the controller or engine (separate or common signals). (See 9-4.1.3 of NFPA 20.) (20:9-4.2)

7-4.4 Field Acceptance Tests. The pump manufacturer, the engine manufacturer (when supplied), the controller manufacturer, and the transfer switch manufacturer (when supplied) or their respective representatives shall be present for the field acceptance test. (See Section 1-6 of NFPA 20.) (20:11-2)

7-4.4.1 All electric wiring to the fire pump motor(s), including control (multiple pumps) interwiring, emergency power supply, and jockey pump, shall be completed and checked by the electrical contractor prior to the initial startup and acceptance test. (20:11-2.1)

7-4.4.2* The authority having jurisdiction shall be notified as to time and place of the field acceptance test. (20:11-2.2)

7-4.4.3 A copy of the manufacturer's certified pump test characteristic curve shall be available for comparison of results of field acceptance test. The fire pump as installed shall equal the performance as indicated on the manufacturer's certified shop test characteristic curve within the accuracy limits of the test equipment. (20:11-2.3)

7-4.4.4 The fire pump shall perform at minimum, rated, and peak loads without objectionable overheating of any component. (20:11-2.4)

7-4.4.5 Vibrations of the fire pump assembly shall not be of a magnitude to warrant potential damage to any fire pump component. (20:11-2.5)

7-4.4.6 Field acceptance tests shall be conducted in accordance with NFPA 20, *Standard for the Installation of Centrifugal Fire Pumps*.

7-4.5 Inspection, Testing, and Maintenance.

7-4.5.1 A fire pump installed in accordance with this Code shall be properly maintained to provide at least the same level of performance and protection as designed. The owner shall be responsible for maintaining the system and keeping it in good working condition.

7-4.5.2 A fire pump installed in accordance with this Code shall be inspected, tested, and maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.

7-4.5.3 Annual Tests.

7-4.5.3.1* An annual test of each pump assembly shall be conducted under minimum, rated, and peak flows of the fire pump by controlling the quantity of water discharged through approved test devices. This test shall be conducted as described in 7-4.5.3.1(a), (b), or (c).

*Exception:** If available suction supplies do not allow flowing of 150 percent of the rated pump capacity, the fire pump shall be operated at maximum allowable discharge. This reduced capacity shall not constitute a noncompliant test.

(a) Use of the pump discharge via the hose streams; pump suction and discharge pressures and the flow measurements of each hose stream shall determine the total pump output. Care shall be taken to prevent water damage by verifying there is adequate drainage for the high-pressure water discharge from hoses.

(b) Use of the pump discharge via the bypass flowmeter to drain or suction the reservoir; pump suction and discharge pressures and the flowmeter measurements shall determine the total pump output.

(c) Use of the pump discharge via the bypass flowmeter to pump suction (closed-loop metering); pump suction and discharge pressures and the flowmeter measurements shall determine the total pump output.

Where the annual test is conducted periodically in accordance with 7-4.5.3.1(c), a test shall be conducted every 3 years in accordance with 7-4.5.3.1(a) or (b) in lieu of the method described in 7-4.5.3.1(c).

Where 7-4.5.3.1(b) or (c) is used, the flowmeter shall be adjusted immediately prior to conducting the test in accordance with the manufacturer's instructions. If the test results are not consistent with the previous annual test, 7-4.5.3.1(a) shall be used. If testing in accordance with 7-4.5.3.1(a) is not possible, a flowmeter calibration shall be performed and the test shall be repeated. (25:5-3.3.1)

7-4.5.3.2 The pertinent visual observations, measurements, and adjustments specified in 7-4.5.3.2.1 and 7-4.5.3.2.2 shall be conducted annually while the pump is running and flowing water under the specified output condition. (25:5-3.3.2)

7-4.5.3.2.1 At No-Flow Condition (Churn). (Conduct this test first.)

(a) Check the circulation relief valve for operation to discharge water. (See 9-5.5 of NFPA 25.)

(b) Check the pressure relief valve (if installed) for proper operation. (See 9-5.5 of NFPA 25.)

(c) Continue the test for $\frac{1}{2}$ hour. (25:5-3.3.2.1)

7-4.5.3.2.2 At Each Flow Condition.

(a) Record the electric motor voltage and current (all lines).

(b) Record the pump speed in rpm.

(c) Record the simultaneous (approximately) readings of pump suction and discharge pressures and pump discharge flow.

(d) Observe the operation of any alarm indicators or any visible abnormalities. (See 9-5.5.1.1 of NFPA 25.) (25:5-3.3.2.2)

7-4.5.3.3 For installations having a device installed to control minimum suction pressure by throttling action, low suction pressure on the device (below set minimum value) shall be simulated while pumping at the rated flow. Throttling action shall be observed for any abnormality (e.g., cavitation, pressure surges, failure to throttle). The simulated low suction pressure on the device shall be removed and throttling action again shall be observed for any abnormality as the pump returns to full flow. (25:5-3.3.3)

7-4.5.3.4 For installations having an automatic transfer switch, the following test shall be performed to ensure that the overcurrent protective devices (i.e., fuses or circuit breakers) do not open. Normal power failure shall be simulated while the pump is delivering peak power output to cause connection of the pump motor to the alternate power source. The pump's peak power output shall be restored (if necessary). The simulated normal power failure condition then shall be removed, which, after a time delay, shall cause the reconnection of the pump motor to the normal power source. (25:5-3.3.4)

7-4.5.3.5 Alarm conditions shall be simulated by activating alarm circuits at alarm sensor locations, and all such local or remote alarm indicating devices (visual and audible) shall be observed for operation. (25:5-3.3.5)

7-4.5.4 Other Tests.

7-4.5.4.1 Engine generator sets supplying emergency or standby power to fire pump assemblies shall be tested routinely in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems*. (25:5-3.4.1)

7-4.5.4.2 Automatic transfer switches shall be tested routinely and exercised in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems*. (25:5-3.4.2)

7-4.5.4.3 Tests of appropriate environmental pump room space conditions (e.g., heating, ventilation, illumination) shall be made to ensure proper manual or automatic operation of the associated equipment. (25:5-3.4.3)

7-4.5.5 Test Results and Evaluation.

7-4.5.5.1 The interpretation of the test results shall be the basis of the determination of adequacy of the pump assembly. Such interpretation shall be made by those skilled in such matters. (25:5-3.5.1)

7-4.5.5.2* The pump test curve shall be compared to the unadjusted field acceptance test curve and the previous annual test curve(s). Increasing engine speed beyond the rated speed of the pump at rated condition is not an acceptable method for meeting the rated pump performance. Theoretical factors for correction to the rated speed shall not be applied where determining the compliance of the pump per the test. (25:5-3.5.2)

7-4.5.5.3 Current and voltage readings whose product does not exceed the product of the rated voltage and rated full-load current multiplied by the permitted motor service factor shall be considered acceptable. Voltage readings at the motor within 5 percent below or 10 percent above the rated (i.e., nameplate) voltage shall be considered acceptable. (25:5-3.5.3)

7-4.5.5.4 The pump shall be capable of supplying the maximum system demand. (25:5-3.5.4)

7-4.6 Pump Operation. In the event of fire pump operation, qualified personnel shall respond to the fire pump location to determine that the fire pump is operating in a satisfactory manner. (20:1-5)

7-4.7 Operation and Maintenance for Diesel Drive Pumps.

7-4.7.1 Weekly Run. Engines shall be started no less than once a week and run for no less than 30 minutes to attain normal running temperature. They shall run smoothly at rated speed. (20:8-6.1)

7-4.7.2* System Performance. Engines shall be kept clean, dry, and well lubricated to ensure adequate performance. (20:8-6.2)

7-4.7.3 Battery Maintenance.

7-4.7.3.1 Storage batteries shall be kept charged at all times. They shall be tested frequently to determine the condition of the battery cells and the amount of charge in the battery. (20:8-6.3.1)

7-4.7.3.2 Only distilled water shall be used in battery cells. The plates shall be kept submerged at all times. (20:8-6.3.2)

7-4.7.3.3 The automatic feature of a battery charger shall not be a substitute for proper maintenance of battery and charger. Periodic inspection of both shall be made. This inspection shall determine that the charger is operating correctly, the water level in the battery is correct, and the battery is holding its proper charge. (20:8-6.3.3)

7-4.7.4 Fuel Supply Maintenance. The fuel storage tanks shall be kept as full as possible at all times, but never less than 50 percent of tank capacity. The tanks shall always be filled by means that will ensure removal of all water and foreign material. (20:8-6.4)

7-4.7.5* Fire Pump Maintenance. A preventive maintenance program shall be established on all components of the pump assembly in accordance with the manufacturer's recommendations. Records shall be maintained on all work performed on the pump, driver, controller, and auxiliary equipment.

In the absence of manufacturer's recommendations for preventive maintenance, Table 5-5.1 of NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, provides alternative requirements. (25:5-5.1)

7-5 Water Supply.

7-5.1 Private fire service mains shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems* and NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*.

7-5.2 Where no piped water supply exists, the requirements of NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*, shall apply.

7-5.3* The installation of devices to protect the public water supply from contamination shall comply with the provisions of

NFPA 13, *Standard for the Installation of Sprinkler Systems*, or NFPA 24, *Standard for the Installation of Private Fire Service Mains and their Appurtenances*, and the plumbing code of the jurisdiction. Backflow prevention devices shall be inspected, tested, and maintained in accordance with the requirements of NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.

7-5.4 Inspection, Testing, and Maintenance.

7-5.4.1 A private fire service main installed in accordance with this Code shall be properly maintained to provide at least the same level of performance and protection as designed. The owner shall be responsible for maintaining the system and keeping it in good working condition.

7-5.4.2 A private fire service main installed in accordance with this Code shall be inspected, tested, and maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.

7-6 Portable Extinguishers.

7-6.1 General Requirements.

7-6.1.1 The installation, maintenance, selection, and distribution of portable fire extinguishers shall be in accordance with this section and NFPA 10, *Standard for Portable Fire Extinguishers*.

7-6.1.2 Portable fire extinguishers used to comply with NFPA 10 shall be listed and labeled and meet or exceed all the requirements of one of the fire test standards and one of the appropriate performance standards shown below:

- (1) *Fire Test Standards.* ANSI/UL 711, CAN/ULC-S508-M90
- (2) *Performance Standards*
 - a. Carbon Dioxide Types. ANSI/UL 154, CAN/ULC-S503-M90
 - b. Dry Chemical Types. ANSI/UL 299, CAN/ULC-S504-M86
 - c. Water Types. ANSI/UL 626, CAN/ULC-S507-92
 - d. Halon Types. ANSI/UL 1093, CAN/ULC-S512-M87
 - e. Film-Forming Foam Types. ANSI/UL 8 (10:1-4.3)

7-6.1.3 Where Required. Fire extinguishers shall be provided where required by this Code and the referenced codes and standards listed in Chapter 32.

7-6.1.4 The classification of fire extinguishers shall consist of a letter that indicates the class of fire on which a fire extinguisher has been found to be effective, preceded by a rating number (Class A and Class B only) that indicates the relative extinguishing effectiveness.

Exception: Fire extinguishers classified for use on Class C, Class D, or Class K hazards shall not be required to have a number preceding the classification letter. (10:1-6.1)

7-6.1.5 Portable fire extinguishers shall be maintained in a fully charged and operable condition, and kept in their designated places at all times when they are not being used. (10:1-6.2)

7-6.1.6 Fire extinguishers shall be conspicuously located where they will be readily accessible and immediately available in the event of fire. Preferably they shall be located along normal paths of travel, including exits from areas. (10:1-6.3)

7-6.1.7 The following types of fire extinguishers are considered obsolete and shall be removed from service:

- (1) Soda acid
- (2) Chemical foam (excluding film-forming agents)

- (3) Vaporizing liquid (e.g., carbon tetrachloride)
- (4) Cartridge-operated water
- (5) Cartridge-operated loaded stream
- (6) Copper or brass shell (excluding pump tanks) joined by soft solder or rivets (10:1-6.4)

7-6.1.8 Cabinets housing fire extinguishers shall not be locked.

Exception: Where fire extinguishers are subject to malicious use, locked cabinets shall be permitted to be used, provided they include means of emergency access. (10:1-6.5)

7-6.1.9* Fire extinguishers shall not be obstructed or obscured from view.

Exception: In large rooms, and in certain locations where visual obstruction cannot be completely avoided, means shall be provided to indicate the location. (10:1-6.6)

7-6.1.10* Portable fire extinguishers other than wheeled types shall be securely installed on the hanger or in the bracket supplied or placed in cabinets or wall recesses. The hanger or bracket shall be securely and properly anchored to the mounting surface in accordance with the manufacturer's instructions. Wheeled-type fire extinguishers shall be located in a designated location. (10:1-6.7)

7-6.1.11 Fire extinguishers installed under conditions where they are subject to dislodgement shall be installed in brackets specifically designed to cope with this problem. (10:1-6.8)

7-6.1.12 Fire extinguishers installed under conditions where they are subject to physical damage, (e.g., from impact, vibration, the environment) shall be adequately protected. (10:1-6.9)

7-6.1.13 Fire extinguishers having a gross weight not exceeding 40 lb (18.14 kg) shall be installed so that the top of the fire extinguisher is not more than 5 ft (1.53 m) above the floor. Fire extinguishers having a gross weight greater than 40 lb (18.14 kg) (except wheeled types) shall be so installed that the top of the fire extinguisher is not more than $3\frac{1}{2}$ ft (1.07 m) above the floor. In no case shall the clearance between the bottom of the fire extinguisher and the floor be less than 4 in. (10.2 cm). (10:1-6.10)

7-6.1.14 Extinguisher operating instructions shall be located on the front of the extinguisher and be clearly visible. Hazardous materials identification systems (HMIS) labels, six-year maintenance labels, hydrotest labels, or other labels shall not be located or placed on the front of the extinguisher.

Exception: Original manufacturer's labels, labels that specifically relate to the extinguisher's operation or fire classification, or inventory control labels specific to that extinguisher. (10:1-6.11)

7-6.1.15 Fire extinguishers mounted in cabinets or wall recesses shall be placed so that the fire extinguisher operating instructions face outward. The location of such fire extinguishers shall be marked conspicuously. (See 7-6.1.9.) (10:1-6.12)

7-6.1.16* Where fire extinguishers are installed in closed cabinets that are exposed to elevated temperatures, the cabinets shall be provided with screened openings and drains. (10:1-6.13)

7-6.1.17* Water-type (e.g., water, AFFF, FFFP) fire extinguishers shall not be installed in areas where the temperatures are outside the range of 40°F to 120°F (4°C to 49°C). All other types shall not be installed in areas where temperatures are outside the range of -40°F to 120°F (-40°C to 49°C). Fire extin-

guishers shall not be exposed to temperatures outside of the range shown on the fire extinguisher label.

Exception No. 1: Where fire extinguishers are installed in locations subject to temperatures outside these ranges, they shall be of a type approved and listed for the temperature to which they are exposed, or they shall be placed in an enclosure capable of maintaining the stipulated temperature range.

Exception No. 2: Fire extinguishers containing plain water only can be protected to temperatures as low as -40°F (-40°C) by the addition of an antifreeze that is stipulated on the fire extinguisher nameplate. Calcium chloride solutions shall not be used in stainless steel fire extinguishers.

Exception No. 3: Some fire extinguishers are approved or listed for use at temperatures as low as -65°F (-54°C). (10:1-6.14)

7-6.1.18* The owner or the owner's agent shall be provided with a fire extinguisher instruction manual that details condensed instructions and cautions necessary to the installation, operation, inspection, and maintenance of the fire extinguisher(s). The manual shall refer to NFPA 10 as a source of detailed instruction. (10:1-6.15)

7-6.2 Selection of Fire Extinguishers.

7-6.2.1* The selection of fire extinguishers for a given situation shall be determined by the character of the fires anticipated, the construction and occupancy of the individual property, the vehicle or hazard to be protected, ambient-temperature conditions, and other factors (see Table A-7-6.2.1). The number, size, placement, and limitations of use of fire extinguishers required shall meet the requirements of Chapter 3 of NFPA 10. (10:2-1)

7-6.2.1.1* Use of halogenated agent fire extinguishers shall be limited to applications where a clean agent is necessary to extinguish fire efficiently without damaging the equipment or area being protected, or where the use of alternate agents can cause a hazard to personnel in the area.

Exception: Halon agent types of fire extinguishers installed before January 1, 1991. (10:2-1.1)

7-6.2.1.2 Placement of portable fire extinguishers containing halogenated agents shall conform to any minimum volume limitations warnings contained on the fire extinguisher nameplates. (10:2-1.1.1)

7-6.2.1.3* Fire extinguishers for protecting Class A hazards shall be selected from the following:

- (1) Water type
- (2) Halogenated agent type (For halon agent-type fire extinguishers, see 7-6.2.1.1.)
- (3) Multipurpose dry chemical type
- (4) Wet chemical type (10:2-2.1.1)

7-6.2.1.4 Fire extinguishers for protection of Class B hazards shall be selected from the following:

- (1) Aqueous film-forming foam (AFFF)
- (2) Film-forming fluoroprotein foam (FFFP)
- (3) Carbon dioxide
- (4) Dry chemical type
- (5) Halogenated agent type (For halon agent-type fire extinguishers, see 7-6.2.1.1.) (10:2-2.1.2)

7-6.2.1.5* Fire extinguishers for protection of Class C hazards shall be selected from types that are specifically listed for use on Class C hazards. (For halon agent-type fire extinguishers, see 7-6.2.1.1.) (10:2-2.1.3)

Table 7-6.3.2.1 Fire Extinguisher Size and Placement for Class A Hazards

| | Light (Low) Hazard Occupancy | Ordinary (Moderate) Hazard Occupancy | Extra (High) Hazard Occupancy |
|---|---------------------------------|---|----------------------------------|
| Minimum rated single extinguisher | 2-A [†] | 2-A [†] | 4-A* |
| Maximum floor area per unit of A | 3000 ft ² | 1500 ft ² | 1000 ft ² |
| Maximum floor area for extinguisher | 11,250 ft ^{2**} | 11,250 ft ^{2**} | 11,250 ft ^{2**} |
| Maximum travel distance to extinguisher | 75 ft | 75 ft | 75 ft |

For SI units: 1 ft = 0.305 m; 1 ft² = 0.0929 m²

*Two 2 1/2-gal (9.46-L) water-type extinguishers can be used to fulfill the requirements of one 4-A rated extinguisher.

**See E-3.3 of NFPA 10.

[†]Up to two water-type extinguishers, each with 1-A rating, can be used to fulfill the requirements of one 2-A rated extinguisher. (10:Table 3-2.1)

7-6.2.1.6* Fire extinguishers and extinguishing agents for the protection of Class D hazards shall be of types approved for use on the specific combustible-metal hazard. (10:2-2.1.4)

7-6.2.1.7 Fire extinguishers and extinguishing agents for the protection of Class K hazards shall be selected from either a wet chemical type or dry chemical type. (10:2-2.1.5)

7-6.3 Distribution of Extinguishers.

7-6.3.1 General.

7-6.3.1.1 Required building protection shall be provided by fire extinguishers suitable for Class A fires. (10:3-1.2.1)

7-6.3.1.2* Occupancy hazard protection shall be provided by fire extinguishers suitable for such Class A, B, C, D, or K fire potentials as might be present. (10:3-1.2.2)

7-6.3.2 Fire Extinguisher Size and Placement for Class A Fires.

7-6.3.2.1 Minimal sizes of fire extinguishers for the listed grades of hazards shall be provided on the basis of Table 7-6.3.2.1, except as modified by 7-6.3.2.3. Fire extinguishers shall be located so that the maximum travel distances shall not exceed those specified in Table 7-6.3.2.1, except as modified by 7-6.3.2.3. (See Appendix E of NFPA 10.) (10:3-2.1)

7-6.3.2.2 Certain smaller fire extinguishers that are charged with a multipurpose dry chemical or a halogenated agent are rated on Class B and Class C fires, but have insufficient effectiveness to earn the minimum 1-A rating even though they have value in extinguishing smaller Class A fires. They shall not be used to meet the requirements of 7-6.3.2.1. (10:3-2.1.1)

7-6.3.2.3 Up to one-half of the complement of fire extinguishers as specified in Table 7-6.3.2.1 shall be permitted to be replaced by uniformly spaced 1 1/2-in. (3.81-cm) hose stations for use by the occupants of the building. Where hose stations are so provided, they shall conform to NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*. The location of hose stations and the placement of fire extinguishers shall be such that the hose stations do not replace more than every other fire extinguisher. (10:3-2.2)

7-6.3.2.4 Where the area of the floor of a building is less than that specified in Table 7-6.3.2.1, at least one fire extinguisher of the minimum size recommended shall be provided. (10:3-2.3)

7-6.3.2.5 The protection requirements shall be permitted to be fulfilled with fire extinguishers of higher rating, provided

the travel distance to such larger fire extinguishers does not exceed 75 ft (22.7 m). (10:3-2.4)

7-6.3.3 Fire Extinguisher Size and Placement for Class B Fires Other than for Fires in Flammable Liquids of Appreciable Depth.

7-6.3.3.1 Minimal sizes of fire extinguishers for the listed grades of hazard shall be provided on the basis of Table 7-6.3.3.1. Fire extinguishers shall be located so that the maximum travel distances do not exceed those specified in the table used. (See Appendix E of NFPA 10.)

Exception: Fire extinguishers of lesser rating, desired for small specific hazards within the general hazard area, can be used, but shall not be considered as fulfilling any part of the requirements of Table 7-6.3.3.1. (10:3-3.1)

Table 7-6.3.3.1 Fire Extinguisher Size and Placement for Class B Hazards

| Type of Hazard | Basic Minimum Extinguisher Rating | Maximum Travel Distance to Extinguishers | |
|---------------------|--------------------------------------|--|-------|
| | | ft | m |
| Light (low) | 5-B | 30 | 9.15 |
| | 10-B | 50 | 15.25 |
| Ordinary (moderate) | 10-B | 30 | 9.15 |
| | 20-B | 50 | 19.25 |
| Extra (high) | 40-B | 30 | 9.15 |
| | 80-B | 50 | 15.25 |

Notes:

1. The specified ratings do not imply that fires of the magnitudes indicated by these ratings will occur, but rather they are provided to give the operators more time and agent to handle difficult spill fires that could occur.

2. For fires involving water-soluble flammable liquids, see 2-3.4 of NFPA 10.

3. For specific hazard applications, see Section 2-3 of NFPA 10. (10:Table 3-3.1)

7-6.3.3.2 Two or more fire extinguishers of lower rating shall not be used to fulfill the protection requirements of Table 7-6.3.3.1.

Exception No. 1: Up to three AFFF or FFFP fire extinguishers of at least 2 1/2-gal (9.46-L) capacity shall be permitted to be used to fulfill extra (high) hazard requirements.

Exception No. 2: Two AFFF or FFFP fire extinguishers of at least 1 1/2-gal (6-L) capacity shall be permitted to be used to fulfill ordinary (moderate) hazard requirements. (10:3-3.2)

7-6.3.3.3 The protection requirements shall be permitted to be fulfilled with fire extinguishers of higher ratings, provided the travel distance to such larger fire extinguishers does not exceed 50 ft (15.25 m). (10:3-3.3)

7-6.3.4* Fire Extinguisher Size and Placement for Class B Fires in Flammable Liquids of Appreciable Depth.

7-6.3.4.1* Portable fire extinguishers shall not be installed as the sole protection for flammable liquid hazards of appreciable depth where the surface area exceeds 10 ft² (0.93 m²).

Exception: Where personnel who are trained in extinguishing fires in the protected hazards are available on the premises, the maximum surface area shall not exceed 20 ft² (1.86 m²). (10:3-4.1)

7-6.3.4.2 For flammable liquid hazards of appreciable depth, a Class B fire extinguisher shall be provided on the basis of at least two numerical units of Class B extinguishing potential per ft² (0.0929 m²) of flammable liquid surface of the largest hazard area. (For fires involving cooking grease or water-soluble flammable liquids, see 2-3.2 and 2-3.4 of NFPA 10, *Standard for Portable Fire Extinguishers*.)

Exception: AFFF- or FFFP-type fire extinguishers shall be permitted to be provided on the basis of 1-B of protection per square foot of hazard. (10:3-4.2)

7-6.3.4.3 Two or more fire extinguishers of lower ratings shall not be used in lieu of the fire extinguisher required for the largest hazard area.

Exception: Up to three AFFF- or FFFP-type fire extinguishers shall be permitted to be used to fulfill the requirements, provided the sum of the Class B ratings meets or exceeds the value required for the largest hazard area. (10:3-4.3)

7-6.3.4.4 Travel distances for portable fire extinguishers shall not exceed 50 ft (15.25 m). (See *Appendix E of NFPA 10*.) (10:3-4.4)

7-6.3.4.5 Scattered or widely separated hazards shall be individually protected. A fire extinguisher in the proximity of a hazard shall be carefully located to be accessible in the presence of a fire without undue danger to the operator. (10:3-4.4.1)

7-6.3.5* Fire Extinguisher Size and Placement for Class C Fires. Fire extinguishers with Class C ratings shall be required where energized electrical equipment can be encountered that would require a nonconducting extinguishing medium. This requirement includes situations where fire either directly involves or surrounds electrical equipment. Since the fire itself is a Class A or Class B hazard, the fire extinguishers shall be sized and located on the basis of the anticipated Class A or Class B hazard. (10:3-5)

7-6.3.6 Fire Extinguisher Size and Placement for Class D Fires.

7-6.3.6.1 Fire extinguishers or extinguishing agents with Class D ratings shall be provided for fires involving combustible metals. (10:3-6.1)

7-6.3.6.2 Fire extinguishers or extinguishing agents (media) shall be located not more than 75 ft (23 m) of travel distance from the Class D hazard. (See *Appendix E-6 of NFPA 10, Standard for Portable Fire Extinguishers*.) (10:3-6.2)

7-6.3.6.3 Portable fire extinguishers or extinguishing agents (media) for Class D hazards shall be provided in those work areas where combustible metal powders, flakes, shavings, chips, or similarly sized products are generated. (10:3-6.3)

7-6.3.6.4 Size determination shall be on the basis of the specific combustible metal, its physical particle size, area to be covered, and recommendations by the fire extinguisher manufacturer on data from control tests conducted. (10:3-6.4)

7-6.3.7 Fire Extinguisher Size and Placement for Class K Fires.

7-6.3.7.1 Fire extinguishers shall be provided for hazards where there is a potential for fires involving combustible cooking media (vegetable or animal oils and fats). (10:3-7.1)

7-6.3.7.2 Maximum travel distance shall not exceed 30 ft (9.15 m) from the hazard to the extinguishers. (10:3-7.2)

7-6.4 Inspection, Maintenance, and Recharging.

7-6.4.1 General.

7-6.4.1.1 The owner or designated agent or occupant of a property in which fire extinguishers are located shall be responsible for such inspection, maintenance, and recharging. (See 4-1.2 and 4-1.4 of NFPA 10.) (10:4-1.3)

7-6.4.1.2* Maintenance, servicing, and recharging shall be performed by trained persons having available the appropriate servicing manual(s), the proper types of tools, recharge materials, lubricants, and manufacturer's recommended replacement parts or parts specifically listed for use in the fire extinguisher. (10:4-1.4)

7-6.4.1.3* Frequency. Fire extinguishers shall be inspected when initially placed in service and thereafter at approximately 30-day intervals. Fire extinguishers shall be inspected at more frequent intervals when circumstances require. (10:4-3.1)

7-6.4.2 Maintenance.

7-6.4.2.1 Frequency. Fire extinguishers shall be subjected to maintenance at intervals of not more than 1 year, at the time of hydrostatic test, or when specifically indicated by an inspection. (10:4-4.1)

7-6.4.2.2 Fire extinguishers removed from service for maintenance or recharge shall be replaced by a fire extinguisher suitable for the type of hazard being protected and shall be of at least equal rating. (10:4-4.1.4)

7-6.4.2.3* Maintenance Recordkeeping. Each fire extinguisher shall have a tag or label securely attached that indicates the month and year the maintenance was performed and that identifies the person performing the service. (10:4-4.4)

7-6.4.2.4 All rechargeable-type fire extinguishers shall be recharged after any use or as indicated by an inspection or when performing maintenance. (10:4-5.1.1)

7-6.4.2.5 Hydrostatic testing shall be performed by persons trained in pressure testing procedures and safeguards who have suitable testing equipment, facilities, and appropriate servicing manual(s) available. (10:5-1.2)

7-6.4.2.6 If, at any time, a fire extinguisher shows evidence of dents, mechanical injury, or corrosion to the extent as to indicate weakness, it shall be condemned or hydrostatically retested subject to the provisions of 5-1.4 and 5-1.5 of NFPA 10.

Exception No. 1: Pump tanks.

Exception No. 2: Nonrechargeable fire extinguishers other than halogenated agent-types shall be discharged and discarded.

Exception No. 3: Nonrechargeable halon agent-type fire extinguishers. (See 4-3.3.3 of NFPA 10.) (10:5-1.3)

7-6.4.2.7 Examination of Cylinder Condition. Where a fire extinguisher cylinder or shell has one or more of the following conditions, it shall not be hydrostatically tested, but shall be condemned or destroyed by the owner or at the owner's direction:

- (1) *Where repairs by soldering, welding, brazing, or use of patching compounds exist
- (2) Where the cylinder threads are worn, corroded, broken, cracked, or nicked
- (3) Where there is corrosion that has caused pitting, including pitting under a removable nameplate or nameband assembly
- (4) Where the fire extinguisher has been burned in a fire
- (5) Where a calcium chloride type of extinguishing agent was used in a stainless steel fire extinguisher
- (6) Where the shell is of copper or brass construction joined by soft solder or rivets
- (7) Where the depth of a dent exceeds $\frac{1}{10}$ of the greatest dimension of the dent if not in a weld, or exceeds $\frac{1}{4}$ in. (0.6 cm) if the dent includes a weld
- (8) Where any local or general corrosion, cuts, gouges, or dings have removed more than 10 percent of the minimum cylinder wall thickness
- (9) Where a fire extinguisher has been used for any purpose other than that of a fire extinguisher (10:5-1.4)

7-7 Detection, Alarm, and Communication Systems.

7-7.1 General.

7-7.1.1 Where building fire alarm systems or automatic fire detectors are required by other sections of this Code, they shall be provided in accordance with this section and NFPA 72, *National Fire Alarm Code*®.

7-7.1.2 Applications. Protected premises fire alarm systems shall include one or more of the following features:

- (1) Manual alarm signal initiation
- (2) Automatic alarm signal initiation
- (3) Monitoring of abnormal conditions in fire suppression systems
- (4) Activation of fire suppression systems
- (5) Activation of fire safety functions
- (6) Activation of alarm notification appliances
- (7) Emergency voice/alarm communications
- (8) Guard's tour supervisory service
- (9) Process monitoring supervisory systems
- (10) Activation of off-premises signals
- (11) Combination systems
- (12) Integrated systems (72:3-3)

7-7.1.3 All apparatus requiring rewinding or resetting to maintain normal operation shall be rewound or reset as promptly as possible after each test and alarm. All test signals received shall be recorded to indicate date, time, and type. (72:7-4.3)

7-7.2 Where Required.

7-7.2.1 New Assembly Occupancies. Assembly occupancies with occupant loads of more than 300 and all theaters with more than one audience-viewing room shall be provided with an approved fire alarm system in accordance with 9.6.1 and 12.3.4 of NFPA 101.

Exception No. 1: Assembly occupancies that are a part of a mixed occupancy (see 6.1.14 of NFPA 101) shall be permitted to be served by a

common fire alarm system, provided that the individual requirements of each occupancy are met.

Exception No. 2: Voice communication or public address systems complying with 12.3.4.3.3 of NFPA 101 shall not be required to comply with 9.6.1 of NFPA 101. (101:12.3.4.1)

7-7.2.2 Existing Assembly Occupancies. Assembly occupancies with occupant loads of more than 300 and all theaters with more than one audience-viewing room shall be provided with an approved fire alarm system in accordance with 9.6.1 and 13.3.4 of NFPA 101.

Exception No. 1: Assembly occupancies that are a part of a mixed occupancy (see 6.1.14 of NFPA 101) shall be permitted to be served by a common fire alarm system, provided that the individual requirements of each occupancy are met.

Exception No. 2: Voice communication or public address systems complying with 13.3.4.3.3 of NFPA 101 shall not be required to comply with 9.6.1 of NFPA 101.

Exception No. 3: This requirement shall not apply to assembly occupancies where, in the judgment of the authority having jurisdiction, adequate alternative provisions exist or are provided for the discovery of a fire and for alerting the occupants promptly. (101:13.3.4.1)

7-7.2.3 New Educational Occupancies. Educational occupancies shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101.

Exception: This requirement shall not apply to buildings with an area not exceeding 1000 ft² (93 m²) that contains a single classroom and is located not less than 50 ft (15.2 m) from another building. (101:14.3.4.1)

7-7.2.4 Existing Educational Occupancies. Educational occupancies shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101.

Exception: This requirement shall not apply to buildings with an area not exceeding 1000 ft² (93 m²) that contains a single classroom and is located not less than 50 ft (15.2 m) from another building. (101:15.3.4.1)

7-7.2.5 New Health Care Occupancies.

7-7.2.5.1 General. Health care occupancies shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101. (101:18.3.4.1)

7-7.2.5.2 Detection in Spaces Open to Corridors. Corridors shall be separated from all other areas by partitions complying with 18.3.6.2 through 18.3.6.5 of NFPA 101. (See also 18.2.5.9 of NFPA 101.)

Exception No. 1: Spaces shall be permitted to be unlimited in area and open to the corridor, provided that the following criteria are met:

(a) *The spaces are not used for patient sleeping rooms, treatment rooms, or hazardous areas.*

(b) *The corridors onto which the spaces open in the same smoke compartment are protected by an electrically supervised automatic smoke detection system in accordance with 18.3.4 of NFPA 101, or the smoke compartment in which the space is located is protected throughout by quick-response sprinklers.*

(c) *The open space is protected by an electrically supervised automatic smoke detection system in accordance with 18.3.4 of NFPA 101, or the entire space is arranged and located to allow direct supervision by the facility staff from a nurses' station or similar space.*

(d) *The space does not obstruct access to required exits.*

Exception No. 2: Waiting areas shall be permitted to be open to the corridor, provided that the following criteria are met:

(a) *The aggregate waiting area in each smoke compartment does not exceed 600 ft² (55.7 m²).*

(b) *Each area is protected by an electrically supervised automatic smoke detection system in accordance with 18.3.4 of NFPA 101, or each area is arranged and located to allow direct supervision by the facility staff from a nursing station or similar space.*

(c) *The area does not obstruct access to required exits.*

Exception No. 3: Spaces for nurses' stations.*

Exception No. 4: Gift shops open to the corridor where protected in accordance with 18.3.2.5 of NFPA 101.

Exception No. 5: In a limited care facility, group meeting or multipurpose therapeutic spaces shall be permitted to open to the corridor, provided that the following criteria are met:

(a) *The space is not a hazardous area.*

(b) *The space is protected by an electrically supervised automatic smoke detection system in accordance with 18.3.4 of NFPA 101, or the space is arranged and located to allow direct supervision by the facility staff from the nurses' station or similar location.*

(c) *The area does not obstruct access to required exits. (101:18.3.6.1)*

7-7.2.5.3* Nursing Homes. An approved automatic smoke detection system shall be installed in corridors throughout smoke compartments containing patient sleeping rooms and in spaces open to corridors as permitted in nursing homes by 18.3.6.1 of NFPA 101.

Exception No. 1: Corridor systems shall not be required where each patient sleeping room is protected by an approved smoke detection system.

Exception No. 2: Corridor systems shall not be required where patient room doors are equipped with automatic door-closing devices with integral smoke detectors on the room side installed in accordance with their listing, provided that the integral detectors provide occupant notification. (101:18.3.4.5.3)

7-7.2.6 Existing Health Care Occupancies.

7-7.2.6.1 General. Health care occupancies shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101. (101:19.3.4.1)

7-7.2.6.2 Corridors. An approved automatic smoke detection system shall be installed in all corridors of limited care facilities. Such system shall be in accordance with Section 9.6 of NFPA 101.

Exception No. 1: Where each patient sleeping room is protected by an approved smoke detection system, and a smoke detector is provided at smoke barriers and horizontal exits in accordance with Section 9.6 of NFPA 101, the corridor smoke detection system shall not be required on the patient sleeping room floors.

Exception No. 2: Smoke compartments protected throughout by an approved, supervised automatic sprinkler system in accordance with 19.3.5.2 of NFPA 101. (101:19.3.4.5.1)

7-7.2.6.3 Detection in Spaces Open to Corridors. Corridors shall be separated from all other areas by partitions complying with 19.3.6.2 through 19.3.6.5 of NFPA 101. (See also 19.2.5.9 of NFPA 101.)

Exception No. 1: Smoke compartments protected throughout by an approved, supervised automatic sprinkler system in accordance with 19.3.5.3 of NFPA 101 shall be permitted to have spaces that are un-

limited in size open to the corridor, provided that the following criteria are met:

(a) *The spaces are not used for patient sleeping rooms, treatment rooms, or hazardous areas.*

(b) *The corridors onto which the spaces open in the same smoke compartment are protected by an electrically supervised automatic smoke detection system in accordance with 19.3.4 of NFPA 101, or the smoke compartment in which the space is located is protected throughout by quick-response sprinklers.*

(c) *The open space is protected by an electrically supervised automatic smoke detection system in accordance with 19.3.4 of NFPA 101, or the entire space is arranged and located to allow direct supervision by the facility staff from a nurses' station or similar space.*

(d) *The space does not obstruct access to required exits.*

Exception No. 2: In smoke compartments protected throughout by an approved, supervised automatic sprinkler system in accordance with 19.3.5.3 of NFPA 101, waiting areas shall be permitted to be open to the corridor, provided that the following criteria are met:

(a) *The aggregate waiting area in each smoke compartment does not exceed 600 ft² (55.7 m²).*

(b) *Each area is protected by an electrically supervised automatic smoke detection system in accordance with 19.3.4 of NFPA 101, or each area is arranged and located to allow direct supervision by the facility staff from a nursing station or similar space.*

(c) *The area does not obstruct access to required exits.*

Exception No. 3: Spaces for nurses' stations.*

Exception No. 4: Gift shops open to the corridor where protected in accordance with 19.3.2.5 of NFPA 101.

Exception No. 5: Limited care facilities in smoke compartments protected throughout by an approved, supervised automatic sprinkler system in accordance with 19.3.5.3 of NFPA 101 shall be permitted to have group meeting or multipurpose therapeutic spaces open to the corridor, provided that the following criteria are met:

(a) *The space is not a hazardous area.*

(b) *The space is protected by an electrically supervised automatic smoke detection system in accordance with 19.3.4 of NFPA 101, or the space is arranged and located to allow direct supervision by the facility staff from the nurses' station or similar location.*

(c) *The area does not obstruct access to required exits.*

Exception No. 6: Spaces other than patient sleeping rooms, treatment rooms, and hazardous areas shall be permitted to be open to the corridor and unlimited in area, provided that the following criteria are met:

(a) *The space and the corridors onto which it opens, where located in the same smoke compartment, are protected by an electrically supervised automatic smoke detection system in accordance with 19.3.4 of NFPA 101.*

(b)* *Each space is protected by automatic sprinklers, or the furnishings and furniture, in combination with all other combustibles within the area, are of such minimum quantity and arrangement that a fully developed fire is unlikely to occur.*

(c) *The space does not obstruct access to required exits.*

Exception No. 7: Waiting areas shall be permitted to be open to the corridor, provided that the following criteria are met:*

(a) *Each area does not exceed 600 ft² (55.7 m²).*

(b) *The area is equipped with an electrically supervised automatic smoke detection system in accordance with 19.3.4 of NFPA 101.*

(c) *The area does not obstruct any access to required exits.*

Exception No. 8: In a limited care facility, group meeting or multipurpose therapeutic spaces, other than hazardous areas, that are under

continuous supervision by facility staff shall be permitted to be open to the corridor, provided that the following criteria are met:

- (a) *Each area does not exceed 1500 ft² (140 m²).*
- (b) *Not more than one such space is permitted per smoke compartment.*
- (c) *The area is equipped with an electrically supervised automatic smoke detection system in accordance with 19.3.4 of NFPA 101.*
- (d) *The area does not obstruct access to required exits. (101:19.3.6.1)*

7-7.2.7 New Detention and Correctional Occupancies.

7-7.2.7.1 Detention and correctional occupancies shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101, except as modified by 22.3.4.1.2 through 22.3.4.4 of NFPA 101. (101:22.3.4.1.1)

7-7.2.7.2* An approved automatic smoke detection system shall be in accordance with Section 9.6 of NFPA 101, as modified by 7-7.2.7.2.1 through 7-7.2.7.2.3, throughout all resident sleeping areas and adjacent day rooms, activity rooms, or contiguous common spaces. (101:22.3.4.4)

7-7.2.7.2.1 Smoke detectors shall not be required in sleeping rooms with four or fewer occupants. (101:22.3.4.4.1)

7-7.2.7.2.2 Other arrangements and positioning of smoke detectors shall be permitted to prevent damage or tampering, or for other purposes. Such arrangements shall be capable of detecting any fire, and the placement of detectors shall be such that the speed of detection is equivalent to that provided by the spacing and arrangements required by the installation standards referenced in Section 9.6 of NFPA 101. Detectors shall be permitted to be located in exhaust ducts from cells, behind grilles, or in other locations. The equivalent performance of the design, however, shall be acceptable to the authority having jurisdiction in accordance with the equivalency concepts specified in Section 1.5 of NFPA 101. (101:22.3.4.4.2)

7-7.2.7.2.3* Smoke detectors shall not be required in Use Condition II open dormitories where staff is present within the dormitory whenever the dormitory is occupied. (101:22.3.4.4.3)

7-7.2.8 Existing Detention and Correctional Occupancies.

7-7.2.8.1 Detention and correctional occupancies shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101, except as modified by 23.3.4.1.2 through 23.3.4.4 of NFPA 101.

Exception: Existing systems lacking the monitoring of wiring required by 9.6.1.6 of NFPA 101 shall be permitted to be continued in use in buildings protected by a complete automatic extinguishing system. (101:23.3.4.1.1)

7-7.2.8.2 An approved automatic smoke detection system shall be in accordance with Section 9.6 of NFPA 101, as modified by 7-7.2.8.2.1 through 7-7.2.8.2.4, throughout all resident housing areas. (101:23.3.4.4)

7-7.2.8.2.1 Smoke detectors shall not be required in sleeping rooms with four or fewer occupants in Use Condition II or Use Condition III. (101:23.3.4.4.1)

7-7.2.8.2.2 Other arrangements and positioning of smoke detectors shall be permitted to prevent damage or tampering, or for other purposes. Such arrangements shall be capable of detecting any fire, and the placement of detectors shall be

such that the speed of detection is equivalent to that provided by the spacing and arrangements required by the installation standards referenced in Section 9.6 of NFPA 101. Detectors shall be permitted to be located in exhaust ducts from cells, behind grilles, or in other locations. The equivalent performance of the design, however, shall be acceptable to the authority having jurisdiction in accordance with the equivalency concepts specified in Section 1.5 of NFPA 101. (101:23.3.4.4.2)

7-7.2.8.2.3* Smoke detectors shall not be required in Use Condition II open dormitories where staff is present within the dormitory whenever the dormitory is occupied and the building is protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101. (101:23.3.4.4.3)

7-7.2.8.2.4 In smoke compartments protected throughout by an approved automatic sprinkler system in accordance with 23.3.5.3 of NFPA 101, smoke detectors shall not be required, except in corridors, common spaces, and sleeping rooms with more than four occupants. (101:23.3.4.4.4)

7-7.2.9 New Hotels and Dormitories.

7-7.2.9.1 A fire alarm system in accordance with Section 9.6 of NFPA 101, except as modified by 28.3.4.2 through 28.3.4.5 of NFPA 101, shall be provided. (101:28.3.4.1)

7-7.2.9.2 A corridor smoke detection system in accordance with Section 9.6 of NFPA 101 shall be provided.

Exception: Buildings protected throughout by an approved, supervised automatic sprinkler system in accordance with 28.3.5.1 of NFPA 101. (101:28.3.4.4)

7-7.2.9.3* An approved single-station smoke alarm shall be installed in accordance with 9.6.2.10 of NFPA 101 in every guest room and every living area and sleeping room within a guest suite. (101:28.3.4.5)

7-7.2.10 Existing Hotels and Dormitories.

7-7.2.10.1 A fire alarm system in accordance with Section 9.6 of NFPA 101, except as modified by 29.3.4.2 through 29.3.4.5 of NFPA 101, shall be provided.

Exception: Buildings where each guest room has exterior exit access in accordance with 7.5.3 of NFPA 101, and the building does not exceed three stories in height. (101:29.3.4.1)

7-7.2.10.2 An approved single-station smoke alarm shall be installed in accordance with 9.6.2.10 of NFPA 101 in every guest room and every living area and sleeping room within a guest suite. These alarms shall not be required to be interconnected. Single-station smoke alarms without a secondary (standby) power source shall be permitted. (101:29.3.4.5)

7-7.2.11 New Apartment Buildings.

7-7.2.11.1 Apartment buildings with more than three stories or with more than 11 dwelling units shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101, except as modified by 30.3.4.2 through 30.3.4.5 of NFPA 101.

Exception No. 1: Where each dwelling unit is separated from other contiguous dwelling units by fire barriers (see 8.2.3 of NFPA 101) having a fire resistance rating of not less than 1 hour, and where each dwelling unit has either its own independent exit or its own independent stairway or ramp discharging at grade.

Exception No. 2: Buildings that are protected throughout by an approved, automatic sprinkler system in accordance with 30.3.5.1 of

NFPA 101, that do not exceed four stories in height, and that contain not more than 16 dwelling units. (101:30.3.4.1)

7-7.2.11.2* Approved single-station smoke alarms shall be installed in accordance with 9.6.2.10 of NFPA 101 outside every sleeping area in the immediate vicinity of the bedrooms and on all levels of the dwelling unit, including basements. (101:30.3.4.5.1)

7-7.2.11.3 Approved single-station smoke alarms shall be installed in accordance with 9.6.2.10 of NFPA 101 in every sleeping room.

Exception: In buildings protected throughout by an approved, supervised automatic sprinkler system in accordance with 30.3.5 of NFPA 101. (101:30.3.4.5.2)

7-7.2.12 Existing Apartment Buildings.

7-7.2.12.1 Apartment buildings with more than three stories or with more than 11 dwelling units shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101, except as modified by 31.3.4.2 through 31.3.4.5 of NFPA 101.

Exception: Where each dwelling unit is separated from other contiguous dwelling units by fire barriers (see 8.2.3 of NFPA 101) having a fire resistance rating of not less than 1/2 hour, and where each dwelling unit has either its own independent exit or its own independent stairway or ramp discharging at grade. (101:31.3.4.1)

7-7.2.12.2 Approved single-station smoke alarms shall be installed in accordance with 9.6.2.10 of NFPA 101 outside every sleeping area in the immediate vicinity of the bedrooms and on all levels of the dwelling unit, including basements.

Exception No. 1: The single-station smoke alarm shall not be required where the building is equipped throughout with an existing, complete automatic smoke detection system.

Exception No. 2: Single-station smoke alarms without a secondary (standby) power source shall be permitted. (101:31.3.4.5.1)

7-7.2.13 Lodging and Rooming Houses.

7-7.2.13.1 Lodging and rooming houses shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101.

Exception: Existing lodging and rooming houses that have an existing smoke detection system meeting or exceeding the requirements of 7-7.2.13.2 where that detection system includes not less than one manual fire alarm box per floor arranged to initiate the smoke detection alarm. (101:26.3.3.1)

7-7.2.13.2 Approved single-station smoke alarms shall be installed in accordance with 9.6.2.10 of NFPA 101 in every sleeping room. Such smoke alarms shall not be required to be interconnected.

Exception: Existing battery-powered smoke alarms, rather than house electric-powered smoke alarms, shall be permitted where the facility has demonstrated to the authority having jurisdiction that the testing, maintenance, and battery replacement programs will ensure reliability of power to the smoke alarms. (101:26.3.3.5)

7-7.2.14 One- and Two-Family Dwellings. Approved, single-station smoke alarms shall be installed in accordance with 9.6.2.10 of NFPA 101 in the following locations:

- (1) All sleeping rooms

Exception: Smoke alarms shall not be required in sleeping rooms in existing one- and two-family dwellings.

- (2) Outside of each separate sleeping area, in the immediate vicinity of the sleeping rooms
- (3) On each level of the dwelling unit, including basements

Exception No. 1: Dwelling units protected by an approved smoke detection system in accordance with Section 9.6 of NFPA 101 and equipped with an approved means of occupant notification.

Exception No. 2: In existing one- and two-family dwellings approved smoke alarms powered by batteries shall be permitted. (101:24.3.4)

7-7.2.15 New Residential Board and Care Occupancies.

7-7.2.15.1 Small Facilities with Sleeping Accommodations for not More than 16 Residents.

7-7.2.15.1.1 A manual fire alarm system shall be provided in accordance with Section 9.6 of NFPA 101. (101:32.2.3.4.1)

7-7.2.15.1.2 Approved smoke alarms shall be provided in accordance with 9.6.2.10 of NFPA 101. Smoke alarms shall be installed on all levels, including basements but excluding crawl spaces and unfinished attics. Additional smoke alarms shall be installed for all living areas as defined in 3.3.13.3 of NFPA 101.

Exception: Smoke alarms shall not be required in buildings protected throughout by an approved automatic sprinkler system in accordance with 7-3.2.16.2. (101:32.2.3.4.3.1)

7-7.2.15.1.3 Each sleeping room shall be provided with an approved, listed single-station smoke alarm in accordance with 9.6.2.10 of NFPA 101. (101:32.2.3.4.3.2)

7-7.2.15.2 Large Facilities with Sleeping Accommodations for not More than 16 Residents.

7-7.2.15.2.1 A fire alarm system in accordance with Section 9.6 of NFPA 101 shall be provided. (101:32.3.3.4.1)

7-7.2.15.2.2 Each sleeping room shall be provided with an approved smoke alarm in accordance with 9.6.2.10 of NFPA 101 that is powered from the building electrical system. (101:32.3.3.4.7)

7-7.2.15.2.3 All living areas as defined in 3.3.13.3 of NFPA 101 and corridors shall be provided with smoke detectors in accordance with NFPA 72, *National Fire Alarm Code*, that are arranged to initiate an alarm that is audible in all sleeping areas.

Exception No. 1: Detectors shall not be required in living areas in facilities protected throughout by an approved, supervised automatic sprinkler system in accordance with 7-3.2.16.1.

Exception No. 2: Unenclosed corridors, passageways, balconies, colonnades, or other arrangements with one or more sides along the long dimension fully or extensively open to the exterior at all times. (101:32.3.3.4.8)

7-7.2.16 Existing Residential Board and Care Occupancies.

7-7.2.16.1 Small Facilities with Sleeping Accommodations for not More than 16 Residents.

7-7.2.16.1.1 A manual fire alarm system shall be provided in accordance with Section 9.6 of NFPA 101.

Exception No. 1: Where there are interconnected smoke detectors meeting the requirements of 7-7.2.16.1.2 and there is not less than one manual fire alarm box per floor arranged to continuously sound the smoke detector alarms.

Exception No. 2: Other manually activated continuously sounding alarms acceptable to the authority having jurisdiction. (101:33.2.3.4.1)

7-7.2.16.1.2* Approved smoke alarms shall be provided in accordance with 9.6.2.10 of NFPA 101. These alarms shall be powered from the building electrical system and, when activated, shall initiate an alarm that is audible in all sleeping areas. Smoke alarms shall be installed on all levels, including basements but excluding crawl spaces and unfinished attics. Additional smoke alarms shall be installed for living rooms, dens, day rooms, and similar spaces.

Exception No. 1: Buildings protected throughout by an approved automatic sprinkler system, in accordance with 7-3.2.17.2 that uses quick-response or residential sprinklers, and protected with approved smoke alarms installed in each sleeping room, in accordance with 9.6.2.10 of NFPA 101, that are powered by the building electrical system.

Exception No. 2: Where buildings are protected throughout by an approved automatic sprinkler system, in accordance with 7-3.2.17.2, that uses quick-response or residential sprinklers, with existing battery-powered smoke alarms in each sleeping room, and where, in the opinion of the authority having jurisdiction, the facility has demonstrated that testing, maintenance, and a battery replacement program ensure the reliability of power to the smoke alarms. (101:33.2.3.4.3)

7-7.2.16.2 Large Facilities with Sleeping Accommodations for not More than 16 Residents.

7-7.2.16.2.1 A fire alarm system in accordance with Section 9.6 of NFPA 101 shall be provided.

Exception: Where each sleeping room has exterior exit access in accordance with 7.5.3 of NFPA 101 and the building is not more than three stories in height. (101:33.3.3.4.1)

7-7.2.16.2.2 Each sleeping room shall be provided with an approved smoke alarm in accordance with 9.6.2.10 of NFPA 101 that is powered from the building electrical system.

Exception No. 1: Existing battery-powered smoke alarms, rather than building electrical service-powered smoke alarms, shall be accepted where, in the opinion of the authority having jurisdiction, the facility has demonstrated that testing, maintenance, and battery replacement programs ensure the reliability of power to the smoke alarms.

Exception No. 2: Facilities having an existing corridor smoke detection system in accordance with Section 9.6 of NFPA 101 that is connected to the building fire alarm system. (101:33.3.3.4.7)

7-7.2.16.2.3 Smoke Detection Systems. All living areas as defined in 3.3.13.3 of NFPA 101 and corridors shall be provided with smoke detectors in accordance with NFPA 72, National Fire Alarm Code, that are arranged to initiate an alarm that is audible in all sleeping areas.

Exception No. 1: Detectors shall not be required in living areas and kitchens in facilities protected throughout by an approved automatic sprinkler system installed in accordance with 7-3.2.17.1.

Exception No. 2: Unenclosed corridors, passageways, balconies, colonnades, or other arrangements with one or more sides along the long dimension fully or extensively open to the exterior at all times. (101:33.3.3.4.8)

7-7.2.17 New Mercantile Occupancies.

7-7.2.17.1 Class A mercantile occupancies shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101. (101:36.3.4.1)

7-7.2.17.2 Covered malls shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101. (101:36.4.4.3.1)

7-7.2.17.3 Bulk merchandising retail buildings shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101. (101:36.4.5.4.1)

7-7.2.18 Existing Mercantile Occupancies.

7-7.2.18.1 Class A mercantile occupancies shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101. (101:37.3.4.1)

7-7.2.18.2 Covered malls shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101. (101:37.4.4.3.1)

7-7.2.18.3 Bulk merchandising retail buildings shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101. (101:37.4.5.4.1)

7-7.2.19 New Business Occupancies. A fire alarm system in accordance with Section 9.6 of NFPA 101 shall be provided in any business occupancy where any one of the following conditions exists:

- (1) The building is two or more stories in height above the level of exit discharge.
- (2) The occupancy is subject to 50 or more occupants above or below the level of exit discharge.
- (3) The occupancy is subject to 300 or more total occupants. (101:38.3.4.1)

7-7.2.20 Existing Business Occupancies. A fire alarm system in accordance with Section 9.6 of NFPA 101 shall be provided in any business occupancy where any one of the following conditions exists:

- (1) The building is two or more stories in height above the level of exit discharge.
- (2) The occupancy is subject to 100 or more occupants above or below the level of exit discharge.
- (3) The occupancy is subject to 1000 or more total occupants. (101:39.3.4.1)

7-7.2.21 Industrial Occupancies. Industrial occupancies shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101.

Exception: If the total capacity of the building is under 100 persons and fewer than 25 persons are above or below the level of exit discharge. (101:40.3.4.1)

7-7.2.22 Storage Occupancies.

7-7.2.22.1 Storage occupancies shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101.

Exception No. 1: Storage occupancies limited to low hazard contents.

Exception No. 2: Storage occupancies with ordinary or high hazard contents not exceeding an aggregate floor area of 100,000 ft² (9300 m²).

Exception No. 3: Storage occupancies protected throughout by approved automatic extinguishment protection. (101:42.3.4.1)

7-7.2.22.2 Parking structures exceeding an aggregate floor area of 100,000 ft² (9300 m²) shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101.

Exception No. 1: Open-air parking structures.

Exception No. 2: Parking structures protected throughout by an approved automatic sprinkler system in accordance with Section 9.7 of NFPA 101. (101:42.8.3.4.1)

7-7.2.23 New Day-Care Occupancies.

7-7.2.23.1 Day-care occupancies, other than day-care occupancies housed in one room, shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101. (101:16.3.4.1)

7-7.2.23.2 A smoke detection system in accordance with Section 9.6 of NFPA 101 shall be installed in day-care occupancies, other than those housed in one room. Detectors shall be installed on each story in front of the doors to the stairways and in the corridors of all floors occupied by the day-care occupancy. Detectors also shall be installed in lounges, recreation areas, and sleeping rooms in the day-care occupancy. (101:16.3.4.5)

7-7.2.23.3 Day-Care Homes.

7-7.2.23.3.1 Smoke alarms shall be installed within day-care homes in accordance with 9.6.2.10 of NFPA 101. (101:16.6.3.4.1)

7-7.2.23.3.2 Where the day-care home is located within a building of another occupancy, such as in an apartment building or office building, any corridors serving the day-care home shall be provided with a smoke detection system in accordance with Section 9.6 of NFPA 101. (101:16.6.3.4.2)

7-7.2.23.3.3 Single-station smoke alarms in accordance with 9.6.2.10 of NFPA 101 that are powered by the building electrical system, or system detectors with integral sounding devices in accordance with 9.6.1.4 of NFPA 101, shall be provided in all rooms used for sleeping. (101:16.6.3.4.3)

7-7.2.24 Existing Day-Care Occupancies.

7-7.2.24.1 Day-care occupancies, other than day-care occupancies housed in one room, shall be provided with a fire alarm system in accordance with Section 9.6 of NFPA 101. (101:17.3.4.1)

7-7.2.24.2 A smoke detection system in accordance with Section 9.6 of NFPA 101 shall be installed in day-care occupancies, other than those housed in one room or those housing clients capable of self-preservation if no sleeping facilities are provided. Detectors shall be installed on each story in front of the doors to the stairways and in the corridors of all floors occupied by the day-care occupancy. Detectors also shall be installed in lounges, recreation areas, and sleeping rooms in the day-care occupancy. (101:17.3.4.5)

7-7.2.24.3 Day Care Homes.

7-7.2.24.3.1 Smoke alarms shall be installed within day-care homes in accordance with 9.6.2.10 of NFPA 101. (101:17.6.3.4.1)

7-7.2.24.3.2 Where the day-care home is located within a building of another occupancy, such as in an apartment building or office building, any corridors serving the day-care home shall be provided with a smoke detection system in accordance with Section 9.6 of NFPA 101. (101:17.6.3.4.2)

7-7.2.24.3.3 Single-station smoke alarms in accordance with 9.6.2.10 of NFPA 101 that are powered by the building electrical system, or system detectors with integral sounding devices

in accordance with 9.6.1.4 of NFPA 101, shall be provided in all rooms used for sleeping.

Exception: Existing battery-powered smoke alarms rather than house electrical service-powered smoke alarms shall be permitted where, in the opinion of the authority having jurisdiction, the facility has demonstrated testing, maintenance, and battery replacement programs that ensure reliability of power to the smoke alarms. (101:17.6.3.4.3)

7-7.2.25 New Ambulatory Health Care Occupancies. Ambulatory health care facilities shall be provided with fire alarm systems in accordance with Section 9.6 of NFPA 101, except as modified by 20.3.4.2 through 20.3.4.5 of NFPA 101. (101:20.3.4.1)

7-7.2.26 Existing Ambulatory Health Care Occupancies. Ambulatory health care facilities shall be provided with fire alarm systems in accordance with Section 9.6 of NFPA 101, except as modified by 21.3.4.2 through 21.3.4.5 of NFPA 101. (101:21.3.4.1)

7-7.2.27 Special Structures and High Rise Buildings.

7-7.2.27.1 Detection, Alarm, and Communications Systems. Towers designed for occupancy by not more than three persons shall be exempt from requirements for detection, alarm, and communications systems. (101:11.3.3.4)

7-7.2.27.2 High-Rise Buildings.

7-7.2.27.2.1* A fire alarm system using an approved, emergency voice/alarm communication system shall be installed in accordance with Section 9.6 of NFPA 101. (101:11.8.3.1)

7-7.2.27.2.2 Two-way telephone communication service shall be provided for fire department use. This system shall be in accordance with NFPA 72, *National Fire Alarm Code*. The communications system shall operate between the central control station and every elevator car, every elevator lobby, and each floor level of exit stairs.

Exception: This requirement shall not apply where the fire department radio system is approved as an equivalent system. (101:11.8.3.2)

7-7.3 Fire Alarm Systems.

7-7.3.1 Introduction.

7-7.3.1.1* Fire alarm systems serving two or more zones shall identify the zone of origin of the alarm initiation by annunciation or coded signal. (72:1-5.7.1.2)

7-7.3.1.2 A device or system having materials or forms that differ from those detailed in this code shall be permitted to be examined and tested according to the intent of the code and, if found equivalent, shall be approved. (72:1-3.2)

7-7.3.1.3 Equipment constructed and installed in conformity with this code shall be listed for the purpose for which it is used. (72:1-5.1.2)

7-7.3.1.4 All fire detection devices that receive their power from the initiating device circuit or signaling line circuit of a fire alarm control unit shall be listed for use with the control unit. (72:1-5.3)

7-7.3.2 Inspection, Testing, and Maintenance.

7-7.3.2.1* A record of completion (*Figure 1-6.2.1 of NFPA 72*) shall be prepared for each system. Parts 1, 2, and 4 through 10 shall be completed after the system is installed and the installation wiring has been checked. Part 3 shall be completed after the operational acceptance tests have been completed. A preliminary copy of the record of completion shall be given to the system

owner and, if requested, to other authorities having jurisdiction after completion of the installation wiring tests. A final copy shall be provided after completion of the operational acceptance tests. (72:1-6.2.1)

7-7.3.2.2 Testing shall be performed in accordance with the schedules in Chapter 7 of NFPA 72 or more often if required by the authority having jurisdiction. If automatic testing is performed at least weekly by a remotely monitored fire alarm con-

trol unit specifically listed for the application, the manual testing frequency shall be permitted to be extended to annual. Table 7-7.3.2.2 shall apply.

Exception: Devices or equipment that are inaccessible for safety considerations (for example, continuous process operations, energized electrical equipment, radiation, and excessive height) shall be tested during scheduled shutdowns if approved by the authority having jurisdiction but shall not be tested more than every 18 months. (72:7-3.2)

Table 7-7.3.2.2 Testing Frequencies

| Component | Initial/ Reacceptance | Monthly | Quarterly | Semiannually | Annually | Table 7-2.2 of NFPA 72 Reference |
|---|--------------------------|---------|-----------|--------------|----------|---|
| | | | | | | |
| 1. Control Equipment — Building Systems Connected to Supervising Station | | | | | | 1, 7, 16, 17 |
| a. Functions | X | — | — | — | X | — |
| b. Fuses | X | — | — | — | X | — |
| c. Interfaced Equipment | X | — | — | — | X | — |
| d. Lamps and LEDs | X | — | — | — | X | — |
| e. Primary (Main) Power Supply | X | — | — | — | X | — |
| f. Transponders | X | — | — | — | X | — |
| 2. Control Equipment — Building Systems — Not Connected to a Supervising Station | — | — | — | — | — | 1 |
| a. Functions | X | — | X | — | — | — |
| b. Fuses | X | — | X | — | — | — |
| c. Interfaced Equipment | X | — | X | — | — | — |
| d. Lamps and LEDs | X | — | X | — | — | — |
| e. Primary (Main) Power Supply | X | — | X | — | — | — |
| f. Transponders | X | — | X | — | — | — |
| 3. Engine-Driven Generator — Central Station Facilities and Fire Alarm Systems | X | X | — | — | — | — |
| 4. Engine-Driven Generator — Public Fire Alarm Reporting Systems | X | — | — | — | — | — |
| 5. Batteries — Central Station Facilities | | | | | | |
| a. Lead-Acid Type | — | — | — | — | — | 6b |
| 1. Charger Test (Replace battery as needed.) | X | — | — | — | X | — |
| 2. Discharge Test (30 minutes) | X | X | — | — | — | — |
| 3. Load Voltage Test | X | X | — | — | — | — |
| 4. Specific Gravity | X | — | — | X | — | — |
| b. Nickel-Cadmium Type | — | — | — | — | — | 6c |
| 1. Charger Test (Replace battery as needed.) | X | — | X | — | — | — |
| 2. Discharge Test (30 minutes) | X | — | — | — | X | — |
| 3. Load Voltage Test | X | — | — | — | X | — |
| c. Sealed Lead-Acid Type | X | X | — | — | — | 6d |
| 1. Charger Test (Replace battery as needed.) | — | X | X | — | — | — |
| 2. Discharge Test (30 minutes) | X | X | — | — | — | — |
| 3. Load Voltage Test | X | X | — | — | — | — |
| 6. Batteries — Fire Alarm Systems | | | | | | |
| a. Lead-Acid Type | — | — | — | — | — | 6b |
| 1. Charger Test (Replace battery as needed.) | X | — | — | — | X | — |
| 2. Discharge Test (30 minutes) | X | — | — | X | — | — |
| 3. Load Voltage Test | X | — | — | X | — | — |
| 4. Specific Gravity | X | — | — | X | — | — |

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Table 7-7.3.2.2 Testing Frequencies (Continued)

| Component | Initial/ Reacceptance | Monthly | Quarterly | Semiannually | Annually | Table 7-2.2 of NFPA 72 Reference |
|---|--------------------------|---------|-----------|--------------|----------|---|
| | | | | | | |
| b. Nickel-Cadmium Type | — | — | — | — | — | 6c |
| 1. Charger Test (Replace battery as needed.) | X | — | — | — | X | — |
| 2. Discharge Test (30 minutes) | X | — | — | — | X | — |
| 3. Load Voltage Test | X | — | — | X | — | — |
| c. Primary Type (Dry Cell) | — | — | — | — | — | 6a |
| 1. Load Voltage Test | X | X | — | — | — | — |
| d. Sealed Lead-Acid Type | — | — | — | — | — | 6d |
| 1. Charger Test (Replace battery every 4 years.) | X | — | — | — | X | — |
| 2. Discharge Test (30 minutes) | X | — | — | — | X | — |
| 3. Load Voltage Test | X | — | — | X | — | — |
| 7. Batteries — Public Fire Alarm Reporting Systems | X (daily) | — | — | — | — | — |
| Voltage tests in accordance with NFPA 72, Table 7-2.2, item 7(a)–(f) | | | | | | |
| a. Lead-Acid Type | — | — | — | — | — | 6b |
| 1. Charger Test (Replace battery as needed.) | X | — | — | — | X | — |
| 2. Discharge Test (2 hours) | X | — | X | — | — | — |
| 3. Load Voltage Test | X | — | X | — | — | — |
| 4. Specific Gravity | X | — | — | X | — | — |
| b. Nickel-Cadmium Type | — | — | — | — | — | 6c |
| 1. Charger Test (Replace battery as needed.) | X | — | — | — | X | — |
| 2. Discharge Test (2 hours) | X | — | — | — | X | — |
| 3. Load Voltage Test | X | — | X | — | — | — |
| c. Sealed Lead-Acid Type | — | — | — | — | — | 6d |
| 1. Charger Test (Replace battery as needed.) | X | — | — | — | X | — |
| 2. Discharge Test (2 hours) | X | — | — | — | X | — |
| 3. Load Voltage Test | X | — | X | — | — | — |
| 8. Fiber-Optic Cable Power | X | — | — | — | X | 12b |
| 9. Control Unit Trouble Signals | X | — | — | — | X | 9 |
| 10. Conductors — Metallic | X | — | — | — | — | 11 |
| 11. Conductors — Nonmetallic | X | — | — | — | — | 12 |
| 12. Emergency Voice/Alarm Communications Equipment | X | — | — | — | X | 18 |
| 13. Retransmission Equipment (The requirements of 7-3.4 of NFPA 72 shall apply.) | X | — | — | — | — | — |
| 14. Remote Annunciators | X | — | — | — | X | 10 |
| 15. Initiating Devices | — | — | — | — | — | 13 |
| a. Duct Detectors | X | — | — | — | X | — |
| b. Electromechanical Releasing Device | X | — | — | — | X | — |
| c. Fire-Extinguishing System(s) or Suppression System(s) Switches | X | — | — | — | X | — |
| d. Fire-Gas and Other Detectors | X | — | — | — | X | — |
| e. Heat Detectors (The requirements of 7-3.2.3 of NFPA 72 shall apply.) | X | — | — | — | X | — |
| f. Fire Alarm Boxes | X | — | — | — | X | — |
| g. Radiant Energy Fire Detectors | X | — | — | X | — | — |
| h. All Smoke Detectors — Functional | X | — | — | — | X | — |
| i. Smoke Detectors — Sensitivity (The requirements of 7-7.4.4 shall apply.) | — | — | — | — | — | — |
| j. Supervisory Signal Devices | X | — | X | — | — | — |

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Table 7-7.3.2.2 Testing Frequencies (Continued)

| Component | Initial/ Reacceptance | Table 7-2.2 of NFPA 72 | | | | Reference |
|--|--------------------------|------------------------|-----------|--------------|----------|-----------|
| | | Monthly | Quarterly | Semiannually | Annually | |
| k. Waterflow Devices (except valve tamper switches) | X | — | — | X | — | — |
| l. Valve Tamper Switches | X | — | — | X | — | — |
| 16. Guard's Tour Equipment | X | — | — | — | X | — |
| 17. Interface Equipment | X | — | — | — | X | 19 |
| 18. Special Hazard Equipment | X | — | — | — | X | 15 |
| 19. Alarm Notification Appliances | — | — | — | — | — | 14 |
| a. Audible Devices | X | — | — | — | X | — |
| b. Audible Textual Notification Appliances | X | — | — | — | X | — |
| c. Visible Devices | X | — | — | — | X | — |
| 20. Off-Premises Transmission Equipment | X | — | X | — | — | — |
| 21. Supervising Station Fire Alarm Systems — Transmitters | — | — | — | — | — | 16 |
| a. DACT | X | — | — | — | X | — |
| b. DART | X | — | — | — | X | — |
| c. McCulloh | X | — | — | — | X | — |
| d. RAT | X | — | — | — | X | — |
| 22. Special Procedures | X | — | — | — | X | 21 |
| 23. Supervising Station Fire Alarm Systems — Receivers | — | — | — | — | — | 17 |
| a. DACR | X | X | — | — | — | — |
| b. DARR | X | X | — | — | — | — |
| c. McCulloh Systems | X | X | — | — | — | — |
| d. Two-Way RF Multiplex | X | X | — | — | — | — |
| e. RASSR | X | X | — | — | — | — |
| f. RARSR | X | X | — | — | — | — |
| g. Private Microwave | X | X | — | — | — | — |

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(72:Table 7-3.2)

7-7.3.3 Manually Actuated Alarm-Initiating Devices. Manual fire alarm boxes shall be used only for fire alarm-initiating purposes. However, combination manual fire alarm boxes and guard's signaling stations shall be permitted. (72:2-8)

7-7.3.3.1 Each manual fire alarm box shall be securely mounted. The operable part of each manual fire alarm box shall be not less than 3¹/₂ ft (1.1 m) and not more than 4¹/₂ ft (1.37 m) above floor level. (72:2-8.1)

7-7.3.3.2 Manual fire alarm boxes shall be located throughout the protected area so that they are unobstructed and accessible. (72:2-8.2.1)

7-7.3.3.3 Manual fire alarm boxes shall be located within 5 ft (1.5 m) of the exit doorway opening at each exit on each floor. (72:2-8.2.2)

7-7.3.3.4* Additional manual fire alarm boxes shall be provided so that the travel distance to the nearest fire alarm box will not be in excess of 200 ft (61 m) measured horizontally on the same floor. (72:2-8.2.4)

7-7.3.3.5* A coded manual fire alarm box shall produce at least three repetitions of the coded signal, with each repetition to consist of at least three impulses. (72:2-8.3)

7-7.3.4 Central Station Fire Alarm Systems. It shall be conspicuously indicated by the prime contractor (*see Chapter 4 of NFPA 72*) that the fire alarm system providing service at a protected premises complies with all applicable requirements of NFPA 72, *National Fire Alarm Code*, by providing a means of verification as specified in either 7-7.3.4.1 or 7-7.3.4.2. (72:1-6.2.3)

7-7.3.4.1 The installation shall be certificated. (72:1-6.2.3.1)

7-7.3.4.1.1 Central station fire alarm systems providing service that complies with all requirements of NFPA 72, *National Fire Alarm Code*, shall be certificated by the organization that has listed the prime contractor, and a document attesting to this certification shall be located on or near the fire alarm system control unit or, where no control unit exists, on or near a fire alarm system component. (72:1-6.2.3.1.1)

7-7.3.4.1.2 A central repository of issued certification documents, accessible to the authority having jurisdiction, shall be maintained by the organization that has listed the central station. (72:1-6.2.3.1.2)

7-7.3.4.2 The installation shall be placarded. (72:1-6.2.3.2)

7-7.3.4.2.1 Central station fire alarm systems providing service that complies with all requirements of NFPA 72, *National Fire Alarm Code*, shall be conspicuously marked by the prime contractor to indicate compliance. The marking shall be by means of one or more securely affixed placards. (72:1-6.2.3.2.1)

7-7.3.4.2.2 The placard(s) shall be 20 in.² (130 cm²) or larger, shall be located on or near the fire alarm system control unit or, where no control unit exists, on or near a fire alarm system component, and shall identify the central station and, where applicable, the prime contractor by name and telephone number. (72:1-6.2.3.2.2)

7-7.3.5 Automatic Fire Detection and Alarm Service.

7-7.3.5.1 Automatic fire detectors shall be located, maintained, and tested in accordance with NFPA 72, *National Fire Alarm Code*.

7-7.3.5.2 Automatic Fire Alarm Signal Initiation. Automatic fire alarm-signal initiation devices that have integral trouble signal contacts shall be connected to the initiating device circuit so that a trouble condition within a device does not impair alarm transmission from any other initiating device.

Exception: Where the trouble condition is caused by electrical disconnection of the device or by removing the initiating device from its plug-in base. (72:3-8.3.2.2)

7-7.3.5.3* Systems equipped with alarm verification features shall be permitted, under the following conditions:

(a) The alarm verification feature is not initially enabled unless conditions or occupant activities that are expected to cause nuisance alarms are anticipated in the area that is protected by the smoke detectors. Enabling of the alarm verification feature shall be protected by password or limited access.

(b) A smoke detector that is continuously subjected to a smoke concentration above alarm threshold does not delay the system functions of 1-5.4 of NFPA 72 by more than 1 minute.

(c) Actuation of an alarm initiating device other than a smoke detector causes the system functions of 1-5.4 of NFPA 72 without additional delay.

(d) When the alarm verification feature is enabled, disabled, or changed, the comments section of the Record of Completion (Figure 1-6.2.1, item 10 of NFPA 72) shall be used to record the status or change to system operation. (72:3-8.3.2.3.1)

7-7.3.5.4 Systems that require the operation of two automatic detectors to initiate the alarm response shall be permitted as follows:

- (1) The systems shall not be prohibited by the authority having jurisdiction.
- (2) There shall be at least two automatic detectors in each protected space.
- (3) The alarm verification feature shall not be used. (72:3-8.3.2.3.3)

7-7.3.6 Waterflow Alarm Service.

7-7.3.6.1 A dry-pipe or preaction sprinkler system that is supplied with water by a connection beyond the alarm-initiating device of a wet-pipe system shall be equipped with a separate waterflow alarm-initiating pressure switch or other approved means to initiate a waterflow alarm. (72:3-8.3.2.4.1)

7-7.3.6.2 Automatic fire suppression system alarm-initiating devices and supervisory signal-initiating devices and their circuits shall be designed and installed so that they cannot be subject to tampering, opening, or removal without initiating a signal. This provision shall include junction boxes installed outside of buildings to facilitate access to the initiating device circuit.

Exception No. 1: Covers of junction boxes inside of buildings.

Exception No. 2: Tamperproof screws or other equivalent mechanical means shall be permitted for preventing access to junction boxes installed outside buildings. (72:3-8.3.4.1)

7-7.3.6.3 The number of waterflow switches permitted to be connected to a single initiating device circuit shall not exceed five. (72:3-8.3.2.4.2)

7-7.3.6.4 The number of supervisory devices permitted to be connected to a single initiating device circuit shall not exceed 20. (72:3-8.3.3.1.1)

7-7.3.6.5* Initiation of the alarm signal shall occur within 90 seconds of waterflow at the alarm-initiating device when flow occurs that is equal to or greater than that from a single sprinkler of the smallest orifice size installed in the system. Movement of water due to waste, surges, or variable pressure shall not be indicated. (72:2-6.2)

7-7.3.7 Monitoring for Integrity.

7-7.3.7.1* All means of interconnecting equipment, devices, and appliances and wiring connections shall be monitored for the integrity of the interconnecting conductors or equivalent path so that the occurrence of a single open or a single ground-fault condition in the installation conductors or other signaling channels and their restoration to normal shall be automatically indicated within 200 seconds.

Exception No. 1: Styles of initiating device circuits, signaling line circuits, and notification appliance circuits tabulated in Table 3-5, Table 3-6, and Table 3-7 of NFPA 72, National Fire Alarm Code, that do not have an "X" under "Trouble" for the abnormal condition indicated.

Exception No. 2: Shorts between conductors, other than as required by 1-5.8.5, 1-5.8.6, 1-5.8.7.1, Table 3-5, Table 3-6, and Table 3-7 of NFPA 72 shall not be subject to this requirement.

Exception No. 3: A noninterfering shunt circuit, provided that a fault circuit condition on the shunt circuit wiring results only in the loss of the noninterfering feature of operation.

Exception No. 4: Connections to and between supplementary system components, provided that single open, ground, or short-circuit conditions of the supplementary equipment or interconnecting means, or both, do not affect the required operation of the fire alarm system.

Exception No. 5: The circuit of an alarm notification appliance installed in the same room with the central control equipment, provided that the notification appliance circuit conductors are installed in conduit or are equivalently protected against mechanical injury.

Exception No. 6: A trouble signal circuit.

Exception No. 7: Interconnection between listed equipment within a common enclosure.*

Exception No. 8: Interconnection between enclosures containing control equipment located within 20 ft (6 m) of each other where the conductors are installed in conduit or equivalently protected against mechanical injury.

Exception No. 9: Conductors for ground detection where a single ground does not prevent the required normal operation of the system.

Exception No. 10: Central station circuits serving notification appliances within a central station.

Exception No. 11: Pneumatic rate-of-rise systems of the continuous line type in which the wiring terminals of such devices are connected in multiple across electrically supervised circuits.

Exception No. 12: Interconnecting wiring of a stationary computer and the computer's keyboard, video monitor, mouse-type device, or touch screen, so long as the interconnecting wiring does not exceed 8 ft (2.4 m) in length; is a listed computer/data processing cable as permitted by NFPA 70, National Electrical Code; and failure of cable does not cause the failure of the required system functions not initiated from the keyboard, mouse, or touch screen.

Exception No. 13: Communications and transmission channels extending from a supervising station to a subsidiary station(s) or protected premises, or both, which are compliant with the requirements of Chapter 5 of NFPA 72 and electrically isolated from the fire alarm system (or circuits) by a transmitter(s), are not required to monitor the integrity of installation conductors for a ground-fault condition, provided that a single ground condition does not affect the required operation of the fire alarm system. (72:1-5.8.1)

7-7.3.7.2 Interconnection means shall be arranged so that a single break or single ground fault does not cause an alarm signal. (72:1-5.8.2)

7-7.3.7.3 An open, ground, or short-circuit fault on the installation conductors of one alarm notification appliance circuit shall not affect the operation of any other alarm notification circuit. (72:1-5.8.4)

7-7.3.7.4 The occurrence of a wire-to-wire short-circuit fault on any alarm notification appliance circuit shall result in a trouble signal at the protected premises.

Exception No. 1: A circuit employed to produce a supplementary local alarm signal, provided that the occurrence of a short circuit on the circuit in no way affects the required operation of the fire alarm system.

Exception No. 2: The circuit of an alarm notification appliance installed in the same room with the central control equipment, provided that the notification appliance circuit conductors are installed in conduit or are equivalently protected against mechanical injury.

Exception No. 3: Central station circuits serving notification appliances within a central station. (72:1-5.8.5)

7-7.3.8* Power Sources. Fire alarm systems shall be provided with at least two independent and reliable power supplies, one primary and one secondary (standby), each of which shall be of adequate capacity for the application.

Where dc voltages are employed, they shall be limited to no more than 350 volts above earth ground. (72:1-5.2.3).

Exception No. 1: Where the primary power is supplied by a dedicated branch circuit of an emergency system in accordance with NFPA 70, National Electrical Code, Article 700, or a legally required standby system in accordance with NFPA 70, National Electrical Code, Article 701, a secondary supply shall not be required.

Exception No. 2: Where the primary power is supplied by a dedicated branch circuit of an optional standby system in accordance with NFPA 70, National Electrical Code, Article 702, which also meets the performance requirements of Article 700 or Article 701, a secondary supply shall not be required.

Where dc voltages are employed, they shall be limited to no more than 350 volts above earth ground. (72:1-5.2.3)

7-7.4 Automatic Fire Detectors.

7-7.4.1 Before requesting final approval of the installation, if required by the authority having jurisdiction, the installing contractor shall furnish a written statement stating that the system has been installed in accordance with approved plans and tested in accordance with the manufacturer's specifications and the appropriate NFPA requirements. (72:1-6.1.2)

7-7.4.2 Installation.

7-7.4.2.1 Where subject to mechanical damage, an initiating device shall be protected. A mechanical guard used to protect a smoke or heat detector shall be listed for use with the detector being used. (72:2-1.3.1)

7-7.4.2.2 In all cases, initiating devices shall be supported independently of their attachment to the circuit conductors. (72:2-1.3.2)

7-7.4.2.3 Detectors shall not be recessed into the mounting surface in any manner.

Exception: If tested and listed for such recessed mounting. (72:2-1.4.1)

7-7.4.2.4* Spot-type heat-sensing fire detectors shall be located on the ceiling not less than 4 in. (100 mm) from the sidewall or on the sidewalls between 4 in. and 12 in. (100 mm and 300 mm) from the ceiling.

Exception No. 1: In the case of solid joist construction, detectors shall be mounted at the bottom of the joists.

Exception No. 2: In the case of beam construction where beams are less than 12 in. (300 mm) in depth and less than 8 ft (2.4 m) on center, detectors shall be permitted to be installed on the bottom of beams. (72:2-2.2.1)

7-7.4.2.5 Line-type heat detectors shall be located on the ceiling or on the sidewalls not more than 20 in. (500 mm) from the ceiling.

Exception No. 1: In the case of solid joist construction, detectors shall be mounted at the bottom of the joists.

Exception No. 2: In the case of beam construction where beams are less than 12 in. (300 mm) in depth and less than 8 ft (2.4 m) on center, detectors shall be permitted to be installed on the bottom of beams.

Exception No. 3: If a line-type detector is used in an application other than open area protection, the manufacturer's installation instructions shall be followed. (72:2-2.2.2)

7-7.4.2.6 Spot-type smoke detectors shall be located on the ceiling not less than 4 in. (100 mm) from a sidewall to the near edge or, if on a sidewall, between 4 in. and 12 in. (100 mm and 300 mm) down from the ceiling to the top of the detector. (Refer to Figure A-7-7.4.2.4.) (72:2-3.4.3.1)

7-7.4.2.7* To minimize dust contamination, smoke detectors, where installed under raised floors, shall be mounted only in an orientation for which they have been listed. (72:2-3.4.3.2)

7-7.4.2.8 Projected beam-type smoke detectors shall be located with their projected beams parallel to the ceiling and in accordance with the manufacturer's documented instructions. The effects of stratification shall be evaluated when locating the detectors.

Exception: Beams shall be permitted to be installed vertically or at any angle needed to afford protection of the hazard involved (for example, vertical beams through the open shaft area of a stairwell where there is a clear vertical space inside the handrails). (72:2-3.4.4)

7-7.4.2.9 Each sampling port of an air sampling-type smoke detector shall be treated as a spot-type detector for the purpose of location and spacing. Maximum air sample transport time from the farthest sampling point shall not exceed 120 seconds. (72:2-3.4.2)

7-7.4.2.10 Detectors shall not be installed until after the construction cleanup of all trades is complete and final.

Exception: Where required by the authority having jurisdiction for protection during construction. Detectors that have been installed during construction and found to have a sensitivity outside the listed and marked sensitivity range shall be cleaned or replaced in accordance with Chapter 7 of NFPA 72 at completion of construction. (72:2-3.6.1.3)

7-7.4.2.11 High Air Movement Areas.

7-7.4.2.11.1 Location. Smoke detectors shall not be located directly in the airstream of supply registers. (72:2-3.6.6.2)

7-7.4.2.11.2 Spacing. Smoke detector spacing shall be in accordance with Table 2-3.6.6.3 and Figure 2-3.6.6.3 of NFPA 72.

Exception: Air-sampling or projected beam smoke detectors installed in accordance with the manufacturer's documented instructions. (72:2-3.6.6.3)

7-7.4.3 Maintenance and Testing.

7-7.4.3.1 The maintenance and testing schedules and procedures for fire alarm and fire detection systems shall be in accordance with Chapter 7 of NFPA 72, *National Fire Alarm Code*.

7-7.4.3.2 Heat Detectors.

7-7.4.3.2.1 Fixed-Temperature, Rate-of-Rise, Rate-of-Compensation, Restorable Line, Spot Type (excluding Pneumatic Tube Type). Heat test shall be performed with a heat source per the manufacturer's recommendations for response within 1 minute. A test method shall be used that is recommended by the manufacturer or other method shall be used that will not damage the nonrestorable fixed-temperature element of a combination rate-of-rise/fixed-temperature element. (72:Table 7-2.2, 13, d, 1)

7-7.4.3.2.2 Fixed-Temperature, Nonrestorable Line Type. Heat test shall not be performed. Functionality shall be tested mechanically and electrically. Loop resistance shall be measured and recorded. Changes from acceptance test shall be investigated. (72:Table 7-2.2, 13, d, 2)

7-7.4.3.2.3 Nonrestorable (General). Heat tests shall not be performed. Functionality shall be tested mechanically and electrically. (72:Table 7-2.2, 13, d, 4)

7-7.4.3.2.4 Restorable Line Type, Pneumatic Tube Only. Heat tests shall be performed (where test chambers are in circuit) or a test with pressure pump shall be conducted. (72:Table 7-2.2, 13, d, 5)

7-7.4.3.3 Smoke Detectors.

7-7.4.3.3.1 Systems Detectors. The detectors shall be tested in place to ensure smoke entry into the sensing chamber and an alarm response. Testing with smoke or listed aerosol approved by the manufacturer shall be permitted as acceptable test methods. Other methods approved by the manufac-

turer that ensure smoke entry into the sensing chamber shall be permitted.

Any of the following tests shall be performed to ensure that each smoke detector is within its listed and marked sensitivity range:

- (1) Calibrated test method
- (2) Manufacturer's calibrated sensitivity test instrument
- (3) Listed control equipment arranged for the purpose
- (4) Smoke detector/control unit arrangement whereby the detector causes a signal at the control unit when its sensitivity is outside its listed sensitivity range
- (5) Other calibrated sensitivity test method approved by the authority having jurisdiction (72:Table 7-2.2, 13, g, 1)

7-7.4.3.3.2 Projected Beam Type. The detector shall be tested by introducing smoke, other aerosol, or an optical filter into the beam path. (72:Table 7-2.2, 13, g, 5)

7-7.4.3.3.3 A functional test shall be performed on all smoke detectors upon initial installation, during reacceptance tests and at least annually as required by Table 7-7.3.2.2 (15, h).

7-7.4.4* Detector sensitivity shall be checked within 1 year after installation and every alternate year thereafter. After the second required calibration test, if sensitivity tests indicate that the detector has remained within its listed and marked sensitivity range (or 4 percent obscuration light gray smoke, if not marked), the length of time between calibration tests shall be permitted to be extended to a maximum of 5 years. If the frequency is extended, records of detector-caused nuisance alarms and subsequent trends of these alarms shall be maintained. In zones or in areas where nuisance alarms show any increase over the previous year, calibration tests shall be performed.

To ensure that each smoke detector is within its listed and marked sensitivity range, it shall be tested using any of the following methods:

- (1) Calibrated test method
- (2) Manufacturer's calibrated sensitivity test instrument
- (3) Listed control equipment arranged for the purpose
- (4) Smoke detector/control unit arrangement whereby the detector causes a signal at the control unit where its sensitivity is outside its listed sensitivity range
- (5) Other calibrated sensitivity test methods approved by the authority having jurisdiction

Detectors found to have a sensitivity outside the listed and marked sensitivity range shall be cleaned and recalibrated or be replaced.

Exception No. 1: Detectors listed as field adjustable shall be permitted to be either adjusted within the listed and marked sensitivity range and cleaned and recalibrated, or they shall be replaced.

Exception No. 2: This requirement shall not apply to single station detectors referenced in 7-3.3 and Table 7-2.2.

The detector sensitivity shall not be tested or measured using any device that administers an unmeasured concentration of smoke or other aerosol into the detector. (72:7-3.2.1)

7-8 Other Fire Protection Systems. Where other fire protection systems are required to be installed by the provisions of this Code, or are installed with the approval of the authority having jurisdiction as an alternative or equivalency, the design and installation of the system shall comply with the appropriate standards listed in Table 7-8. The system shall be tested and maintained in accordance with Section 1-10.

Table 7-8 Other Required Fire Protection Systems

| Type of System | NFPA Standard |
|---|---|
| Low-expansion foam systems | NFPA 11, <i>Standard for Low-Expansion Foam</i> |
| Medium- and high-expansion foam systems | NFPA 11A, <i>Standard for Medium- and High-Expansion Foam Systems</i> |
| Carbon dioxide systems | NFPA 12, <i>Standard on Carbon Dioxide Extinguishing Systems</i> |
| Halon 1301 systems | NFPA 12A, <i>Standard on Halon 1301 Fire Extinguishing Systems</i> |
| Sprinklers in one- and two-family dwellings and manufactured homes | NFPA 13D, <i>Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes</i> |
| Sprinklers in residential occupancies up to and including four stories in height | NFPA 13R, <i>Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height</i> |
| Water spray systems | NFPA 15, <i>Standard for Water Spray Fixed Systems for Fire Protection</i> |
| Deluge foam-water sprinkler, foam-water spray systems, and closed-head foam-water sprinkler systems | NFPA 16, <i>Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems</i> |
| Dry chemical extinguishing systems | NFPA 17, <i>Standard for Dry Chemical Extinguishing Systems</i> |
| Wet chemical extinguishing systems | NFPA 17A, <i>Standard for Wet Chemical Extinguishing Systems</i> |
| Clean agent fire extinguishing systems | NFPA 2001, <i>Standard on Clean Agent Fire Extinguishing Systems</i> |

Chapter 8 Occupancy Fire Safety

8-1 Assembly Occupancies.

8-1.1 Application. New and existing assembly occupancies shall comply with this section and the referenced edition of NFPA 101.

8-1.2 Operating Features.

8-1.2.1 Portable Cooking Equipment. Portable cooking equipment that is not flue-connected shall be permitted only as follows:

- (1) Equipment fueled by small heat sources that can be readily extinguished by water, such as candles or alcohol-burning equipment, including solid alcohol, shall be permitted to be used, provided that precautions satisfactory to the authority having jurisdiction are taken to prevent ignition of any combustible materials.
- (2) Candles shall be permitted to be used on tables used for food service where securely supported on substantial noncombustible bases located to avoid danger of ignition of combustible materials and only where approved by the authority having jurisdiction.
- (3) Candle flames shall be protected.
- (4) "Flaming sword" or other equipment involving open flames and flamed dishes, such as cherries jubilee or crêpe suzette, shall be permitted to be used, provided that precautions subject to the approval of the authority having jurisdiction are taken.
- (5) *Listed and approved LP-Gas commercial food service appliances shall be permitted to be used where in accordance with NFPA 58, *Liquefied Petroleum Gas Code*. (101:12.7.1.4; 101:13.7.1.4)

8-1.2.2 Open Flame Devices and Pyrotechnics. No open flame devices or pyrotechnic device shall be used in any assembly occupancy.

Exception No. 1: Pyrotechnic special effect devices shall be permitted to be used on stages before proximate audiences for ceremonial or religious purposes, as part of a demonstration in exhibits, or as part of a performance, provided that precautions satisfactory to the authority having jurisdiction are taken to prevent ignition of any combustible material and use of the pyrotechnic device complies with NFPA 1126, Standard for the Use of Pyrotechnics before a Proximate Audience.

Exception No. 2: Flame effects before an audience shall be permitted in accordance with NFPA 160, Standard for Flame Effects Before an Audience.

Exception No. 3: Open flame devices shall be permitted to be used in the following situations, provided that precautions satisfactory to the authority having jurisdiction are taken to prevent ignition of any combustible material or injury to occupants:

- (a)* *Where necessary for ceremonial or religious purposes*
- (b) *On stages and platforms as a necessary part of a performance*
- (c) *Where candles on tables are securely supported on substantial noncombustible bases and candle flame is protected*

Exception No. 4: This requirement shall not apply to heat-producing equipment complying with 9.2.2 of NFPA 101.

Exception No. 5: This requirement shall not apply to food service operations in accordance with 12.7.1 or 13.7.1 of NFPA 101.

Exception No. 6: Gas lights shall be permitted to be used, provided that precautions subject to the approval of authority having jurisdiction are taken to prevent ignition of any combustible materials. (101:12.7.2; 101:13.7.2)

8-1.2.3 Furnishings, Decorations, and Scenery.

8-1.2.3.1 Fabrics and films used for decorative purposes, all draperies and curtains, and similar furnishings shall be in accordance with the provisions of 8-1.2.3.2. (101:12.7.3.1; 101:13.7.3.1)

8-1.2.3.2* Draperies, curtains, and other similar loosely hanging furnishings and decorations shall be flame resistant as demonstrated by testing in accordance with NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*. (101:10.3.1)

8-1.2.3.3* Furnishings or decorations of an explosive or highly flammable character shall not be used. (101:10.3.5)

8-1.2.3.4 Fire-retardant coatings shall be maintained to retain the effectiveness of the treatment under service conditions encountered in actual use. (101:10.3.6)

8-1.2.3.5 The authority having jurisdiction shall impose controls on the quantity and arrangement of combustible contents in assembly occupancies to provide an adequate level of safety to life from fire. (101:12.7.3.2; 101:13.7.3.2)

8-1.2.3.6 Exposed foamed plastic materials and unprotected materials containing foamed plastic used for decorative purposes or stage scenery shall have a heat release rate not exceeding 100 kW where tested in accordance with UL 1975, *Standard for Fire Tests for Foamed Plastics Used for Decorative Purposes*.

Exception: This requirement shall not apply to individual foamed plastic items or items containing foamed plastic where the foamed plastic does not exceed 1 lb (0.45 kg) in weight. (101:12.7.3.3; 101:13.7.3.3)

8-1.2.4 Exposition Facilities and Exhibits. Exposition facilities and exhibits shall comply with 12-7.4 of NFPA 101 for new facilities and 13-7.4 of NFPA 101 for existing facilities.

8-1.2.5* Crowd Managers. In assembly occupancies having occupant loads exceeding 1000, there shall be trained crowd managers or crowd manager supervisors at a ratio of 1 crowd manager/supervisor for every 250 occupants. The crowd manager shall receive approved training in crowd management techniques.

Exception No. 1: This requirement shall not apply to assembly occupancies used exclusively for religious worship with an occupant load not exceeding 2000.

Exception No. 2: Where, in the opinion of the authority having jurisdiction, the existence of an approved, supervised automatic sprinkler system and the nature of the event warrant, the ratio of trained crowd managers to occupants shall be permitted to be reduced. (101:12.7.5; 101:13.7.5)

8-1.2.6 Drills.

8-1.2.6.1 The employees or attendants of assembly occupancies shall be trained and drilled in the duties they are to perform in case of fire, panic, or other emergency to effect orderly exiting. (101:12.7.6.1; 101:13.7.6.1)

8-1.2.6.2 Employees or attendants of assembly occupancies shall be instructed in the proper use of portable fire extinguishers and other manual fire suppression equipment where provided. (101:12.7.6.2; 101:13.7.6.2)

8-1.2.6.3 In theaters, motion picture theaters, auditoriums, and other similar assembly occupancies with occupant loads exceeding 300 where there are noncontinuous programs, an

audible announcement shall be made, or a projected image shall be shown, prior to the start of each program to notify occupants of the location of the exits to be used in case of a fire or other emergency.

Exception: This requirement shall not apply to assembly occupancies in schools where used for nonpublic events. (101:12.7.6.3; 101:13.7.6.3)

8-1.2.7 Smoking.

8-1.2.7.1 Smoking in assembly occupancies shall be regulated by the authority having jurisdiction. (101:12.7.7.1; 101:13.7.7.1)

8-1.2.7.2 In rooms or areas where smoking is prohibited, plainly visible signs shall be posted that read as follows:

NO SMOKING

(101:12.7.7.2; 101:13.7.7.2)

8-1.2.7.3 No person shall smoke in prohibited areas that are so posted.

Exception: The authority having jurisdiction shall permit smoking on a stage only where it is a necessary and rehearsed part of a performance and only where the smoker is a regular performing member of the cast. (101:12.7.7.3; 101:13.7.7.3)

8-1.2.7.4 Where smoking is permitted, suitable ashtrays or receptacles shall be provided in convenient locations. (101:12.7.7.4; 101:13.7.7.4)

8-1.2.8 Seating.

8-1.2.8.1 Seats in assembly occupancies accommodating more than 200 persons shall be securely fastened to the floor, except where fastened together in groups of not less than three and not exceeding seven and as permitted by 8-1.2.8.2. All seats in balconies and galleries shall be securely fastened to the floor, except in places of religious worship. (101:12.7.8.1; 101:13.7.8.1)

8-1.2.8.2 Seats not secured to the floor shall be permitted in restaurants, night clubs, and other occupancies where fastening seats to the floor might be impracticable. Such unsecured seats shall be permitted, provided that, in the area used for seating, excluding such areas as dance floors and stages, there is not more than one seat for each 15 ft² (1.4 m²) of net floor area, and adequate aisles to reach exits are maintained at all times. Seating diagrams shall be submitted for approval by the authority having jurisdiction to permit an increase in occupant load per 7.3.1.3 of NFPA 101. (101:12.7.8.2; 101:13.7.8.2)

8-1.2.8.3 Every room constituting an assembly occupancy and not having fixed seats shall have the occupant load of the room posted in a conspicuous place near the main exit from the room. Approved signs shall be maintained in a legible manner by the owner or authorized agent. Signs shall be durable and shall indicate the number of occupants permitted for each room use. (101:12.7.8.3; 101:13.7.8.3)

8-1.2.9 Clothing. Clothing and personal effects shall not be stored in corridors.

Exception No. 1: This requirement shall not apply to corridors protected by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101.

Exception No. 2: This requirement shall not apply to corridor areas protected by a smoke detection system in accordance with Section 9.6 of NFPA 101.

Exception No. 3: This requirement shall not apply to storage in metal lockers, provided that the required egress width is maintained. (101:12.7.11; 101:13.7.11)

8-1.2.10 Projection Room. A conspicuous sign with 1-in. (2.5-cm) block letters shall be posted on the outside of each projection room door and within the projection room proper, unless the projection room is constructed in accordance with NFPA 40, *Standard for the Storage and Handling of Cellulose Nitrate Motion Picture Film*. The sign shall state the following:

SAFETY FILM ONLY PERMITTED IN THIS ROOM

(101:12.4.6.3; 101:13.4.6.3)

8-2 Educational Occupancies.

8-2.1 Application. New and existing educational occupancies shall comply with this section and the referenced edition of NFPA 101.

8-2.2 Operating Features.

8-2.2.1 Emergency Egress and Relocation Drills.

8-2.2.1.1* Emergency egress and relocation drills shall be conducted in accordance with the applicable provisions of 8-2.2.1.2 through 8-2.2.1.8. (101:14.7.1.1; 101:15.7.1.1)

8-2.2.1.2 Emergency egress and relocation drills conforming to the provisions of this Code shall be conducted as specified by the provisions of Chapters 11 through 42 of NFPA 101, or by appropriate action of the authority having jurisdiction. Drills shall be designed in cooperation with the local authorities. (101:4.7.1)

8-2.2.1.3* Emergency egress and relocation drills, where required by Chapters 11 through 42 of NFPA 101 or the authority having jurisdiction, shall be held with sufficient frequency to familiarize occupants with the drill procedure and to establish conduct of the drill as a matter of routine. Drills shall include suitable procedures to ensure that all persons subject to the drill participate. (101:4.7.2)

8-2.2.1.4 Responsibility for the planning and conduct of drills shall be assigned only to competent persons qualified to exercise leadership. (101:4.7.3)

8-2.2.1.5 In the conduct of drills, emphasis shall be placed on orderly evacuation rather than on speed. (101:4.7.4)

8-2.2.1.6 Drills shall be held at expected and unexpected times and under varying conditions to simulate the unusual conditions that can occur in an actual emergency. (101:4.7.5)

8-2.2.1.7 Drill participants shall relocate to a predetermined location and remain at such location until a recall or dismissal signal is given. (101:4.7.6)

8-2.2.1.8 Emergency egress and relocation drills shall be conducted as follows:

- (1) Not less than one emergency egress and relocation drill shall be conducted every month the facility is in session.

Exception: In climates where the weather is severe, the monthly emergency egress and relocation drills shall be permitted to be deferred, provided that the required number of emergency egress and relocation drills is achieved and not less than four are conducted before the drills are deferred.

- (2) All occupants of the building shall participate in the drill.
- (3) One additional emergency egress and relocation drill, other than for educational occupancies that are open on

a year-round basis, shall be required within the first 30 days of operation. (*101:14.7.1.2; 101:15.7.1.2*)

8-2.2.1.9 All emergency and relocation drill alarms shall be sounded on the fire alarm system. (*101:14.7.1.3; 101:15.7.1.3*)

8-2.2.2 Inspection.

8-2.2.2.1* It shall be the duty of principals and teachers to inspect all exit facilities daily to ensure that all stairways, doors, and other exits are in proper condition. (*101:14.7.2.1; 101:15.7.2.1*)

8-2.2.2.2 Open plan buildings shall require extra surveillance to ensure that exit paths are maintained clear of obstruction and are obvious. (*101:14.7.2.2; 101:15.7.2.2*)

8-2.2.3 Furnishings and Decorations.

8-2.2.3.1 Draperies, curtains, and other similar furnishings and decorations in educational occupancies shall be in accordance with the provisions of 10.3.1 of NFPA 101. (*101:14.7.3.1; 101:15.7.3.1*)

8-2.2.3.2* Where required by the applicable provisions of this Code, draperies, curtains, and other similar loosely hanging furnishings and decorations shall be flame resistant as demonstrated by testing in accordance with NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*. (*101:10.3.1*)

8-2.2.3.3* Furnishings or decorations of an explosive or highly flammable character shall not be used. (*101:10.3.5*)

8-2.2.3.4 Fire-retardant coatings shall be maintained to retain the effectiveness of the treatment under service conditions encountered in actual use. (*101:10.3.6*)

8-2.2.3.5 Clothing and personal effects shall not be stored in corridors.

Exception No. 1: This requirement shall not apply to corridors protected by an automatic sprinkler system in accordance with Section 9.7 of NFPA 101.

Exception No. 2: This requirement shall not apply to corridor areas protected by a smoke detection system in accordance with Section 9.6 of NFPA 101.

Exception No. 3: This requirement shall not apply to storage in metal lockers, provided that the required egress width is maintained. (101:14.7.3.2; 101:15.7.3.2)

8-2.2.3.6 Artwork and teaching materials shall be permitted to be attached directly to the walls and shall not exceed 20 percent of the wall area. (*101:14.7.3.3; 101:15.7.3.3*)

8-2.2.4 Notification.

8-2.2.4.1 Occupant notification shall be accomplished automatically in accordance with 9.6.3 of NFPA 101. Positive alarm sequence shall be permitted in accordance with 9.6.3.4 of NFPA 101. (*101:14.3.4.3.1.1; 101:15.3.4.3.1.1*)

8-2.2.4.2 Where acceptable to the authority having jurisdiction, the fire alarm system shall be permitted to be used for other emergency signaling or for class changes, provided that the fire alarm is distinctive in signal and overrides all other use. (*101:14.3.4.3.1.2; 101:15.3.4.3.1.2*)

8-2.2.4.3 Fire department notification shall be accomplished in accordance with 9.6.4 of NFPA 101. (*101:14.3.4.3.2; 101:15.3.4.3.2*)

8-2.2.4.4 All emergency and relocation drill alarms shall be sounded on the fire alarm system. (*101:14.7.1.3; 101:15.7.1.3*)

8-2.2.4.5 In order to prevent students from being returned to a building that is burning, the recall signal shall be separate and distinct from any other signals. Such signal shall be permitted to be given by use of distinctively colored flags or banners. If the recall signal is electric, the push buttons or other controls shall be kept under lock. The key for such lock shall be in the possession of the principal or another designated person in order to prevent a recall at a time when there is an actual fire. Regardless of the method of recall, the means of giving the signal shall be kept under lock. (*101:14.3.4.3.1.3; 101:15.3.4.3.1.3*)

8-2.2.5 Unvented Fuel-Fired Heating Equipment. Unvented fuel-fired heating equipment, other than gas space heaters in compliance with NFPA 54, *National Fuel Gas Code*, shall be prohibited. (*101:14.5.2.2; 101:15.5.2.2*)

8-3 Day-Care Occupancies.

8-3.1 Application. New and existing day-care occupancies shall comply with this section and the referenced edition of NFPA 101.

8-3.2 General Requirements. Unvented fuel-fired room heaters, other than gas space heaters in compliance with NFPA 54, *National Fuel Gas Code*, shall not be permitted. (*101:16.5.2.2; 101:17.5.2.2*)

8-3.3 Day-Care Centers.

8-3.3.1 Classification.

8-3.3.1.1 Section 16.6 of NFPA 101 establishes life safety requirements for day-care homes in which more than three, but not more than 12, clients receive care, maintenance, and supervision by other than their relative(s) or legal guardian(s) for less than 24 hours per day, generally within a dwelling unit. (*See also 16.6.1.4 of NFPA 101.*) (*101:16.6.1.1.2*)

8-3.3.1.2 Where a facility houses more than one age group or self-preservation capability, the strictest requirements applicable to any group present shall apply throughout the day-care home or building, as appropriate to a given area, unless the area housing such a group is maintained as a separate fire area. (*101:16.6.1.1.3*)

8-3.3.1.3 Facilities that supervise clients on a temporary basis with a parent or guardian in close proximity shall not be required to meet the provisions of Section 16.6 of NFPA 101. (*101:16.6.1.1.4*)

8-3.3.1.4 Places of religious worship shall not be required to meet the provisions of Section 16.6 of NFPA 101 where operating a nursery while services are being held in the building. (*101:16.6.1.1.5*)

8-3.3.2* The facility shall have a comprehensive written fire emergency response plan. Copies of the plan shall be made available to all employees. All employees shall be periodically instructed and kept informed with respect to their duties of their position under the plan. (*101:16.7.1*)

8-3.3.3 Operating Features.

8-3.3.3.1 Emergency Egress and Relocation Drills.

8-3.3.3.1.1* Emergency egress and relocation drills shall be conducted in accordance with the applicable provisions of 8-3.3.3.1. (*101:16.7.2.1; 101:17.7.2.1*)

8-3.3.3.1.2 Emergency egress and relocation drills conforming to the provisions of this Code shall be conducted as specified by the provisions of Chapters 11 through 42 of NFPA 101, or by appropriate action of the authority having jurisdiction. Drills shall be designed in cooperation with the local authorities. (101:4.7.1)

8-3.3.3.1.3* Emergency egress and relocation drills, where required by Chapters 11 through 42 of NFPA 101 or the authority having jurisdiction, shall be held with sufficient frequency to familiarize occupants with the drill procedure and to establish conduct of the drill as a matter of routine. Drills shall include suitable procedures to ensure that all persons subject to the drill participate. (101:4.7.2)

8-3.3.3.1.4 Responsibility for the planning and conduct of drills shall be assigned only to competent persons qualified to exercise leadership. (101:4.7.3)

8-3.3.3.1.5 In the conduct of drills, emphasis shall be placed on orderly evacuation rather than on speed. (101:4.7.4)

8-3.3.3.1.6* Drills shall be held at expected and unexpected times and under varying conditions to simulate the unusual conditions that can occur in an actual emergency. (101:4.7.5)

8-3.3.3.1.7 Drill participants shall relocate to a predetermined location and remain at such location until a recall or dismissal signal is given. (101:4.7.6)

8-3.3.3.1.8 Emergency egress and relocation drills shall be conducted as follows:

- (1) Not less than one emergency egress and relocation drill shall be conducted every month the facility is in session.

Exception: In climates where the weather is severe, the monthly emergency egress and relocation drills shall be permitted to be deferred, provided that the required number of emergency egress and relocation drills is achieved and not less than four are conducted before the drills are deferred.

- (2) All occupants of the building shall participate in the drill.
- (3) One additional emergency egress and relocation drill, other than for day-care occupancies that are open on a year-round basis, shall be required within the first 30 days of operation. (101:16.7.2.2; 101:17.7.2.2)

8-3.3.4 Inspections.

8-3.3.4.1 Fire prevention inspections shall be conducted monthly by a trained senior member of the staff. A copy of the latest inspection report shall be posted in a conspicuous place in the day-care facility. (101:16.7.3.1; 101:17.7.3.1)

8-3.3.4.2* It shall be the duty of site administrators and staff members to inspect all exit facilities daily to ensure that all stairways, doors, and other exits are in proper condition. (101:16.7.3.2; 101:17.7.3.2)

8-3.3.4.3 Open plan buildings shall require extra surveillance to ensure that exit paths are maintained clear of obstruction and are obvious. (101:16.7.3.3; 101:17.7.3.3)

8-3.3.5 Furnishings and Decoration.

8-3.3.5.1 Draperies, curtains, and other similar furnishings and decorations in day-care occupancies shall be in accordance with the provisions of 8-3.3.5.2. (101:16.7.4.1; 101:17.7.4.1)

8-3.3.5.2 Where required by the applicable provisions of this Code, draperies, curtains, and other similar loosely hanging

furnishings and decorations shall be flame resistant as demonstrated by testing in accordance with NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*. (101:10.3.1)

8-3.3.5.3 Clothing and personal effects shall not be stored in corridors.

Exception No. 1: This requirement shall not apply to corridors protected by an automatic sprinkler system in accordance with Section 9.7 of NFPA 101.

Exception No. 2: This requirement shall not apply to corridor areas protected by a smoke detection system in accordance with Section 9.6 of NFPA 101.

Exception No. 3: This requirement shall not apply to storage in metal lockers, provided that the required egress width is maintained. (101:16.7.4.2; 101:17.7.4.2)

8-3.3.5.4 Artwork and teaching materials shall be permitted to be attached directly to the walls and shall not exceed 20 percent of the wall area. (101:16.7.4.3; 101:17.7.4.3)

8-3.3.6* Day-Care Staff. Adequate adult staff shall be on duty, alert, awake, and in the facility at all times where clients are present. (101:16.7.5; 101:17.7.5)

8-4 Health Care Occupancies.

8-4.1 Application. New and existing health care occupancies shall comply with this section and the referenced edition of NFPA 101.

8-4.2 Operating Features.

8-4.2.1 Evacuation and Relocation Plan and Fire Drills.

8-4.2.1.1 The administration of every health care occupancy shall have, in effect and available to all supervisory personnel, written copies of a plan for the protection of all persons in the event of fire, for their evacuation to areas of refuge, and for their evacuation from the building when necessary. All employees shall be periodically instructed and kept informed with respect to their duties under the plan. A copy of the plan shall be readily available at all times in the telephone operator's position or at the security center.

The provisions of 8-4.2.1.2 through 8-4.2.2.3 shall apply. (101:18.7.1.1; 101:19.7.1.1)

8-4.2.1.2 Fire drills in health care occupancies shall include the transmission of a fire alarm signal and simulation of emergency fire conditions. Drills shall be conducted quarterly on each shift to familiarize facility personnel (nurses, interns, maintenance engineers, and administrative staff) with the signals and emergency action required under varied conditions. When drills are conducted between 9:00 p.m. (2100 hours) and 6:00 a.m. (0600 hours), a coded announcement shall be permitted to be used instead of audible alarms.

Exception: Infirm or bedridden patients shall not be required to be moved during drills to safe areas or to the exterior of the building. (101:18.7.1.2; 101:19.7.1.2)

8-4.2.1.3 Employees of health care occupancies shall be instructed in life safety procedures and devices. (101:18.7.1.3; 101:19.7.1.3)

8-4.2.2 Procedure in Case of Fire.

8-4.2.2.1 For health care occupancies, the proper protection of patients shall require the prompt and effective response of health care personnel. The basic response required of staff

shall include the removal of all occupants directly involved with the fire emergency, transmission of an appropriate fire alarm signal to warn other building occupants and summon staff, confinement of the effects of the fire by closing doors to isolate the fire area, and the relocation of patients as detailed in the health care occupancy's fire safety plan. (**101:18.7.2.1; 101:19.7.2.1**)

8-4.2.2.2 A written health care occupancy fire safety plan shall provide for the following:

- (1) Use of alarms
- (2) Transmission of alarm to fire department
- (3) Response to alarms
- (4) Isolation of fire
- (5) Evacuation of immediate area
- (6) Evacuation of smoke compartment
- (7) Preparation of floors and building for evacuation
- (8) Extinguishment of fire (**101:18.7.2.2; 101:19.7.2.2**)

8-4.2.2.3 All health care occupancy personnel shall be instructed in the use of and response to fire alarms. In addition, they shall be instructed in the use of the code phrase to ensure transmission of an alarm under the following conditions:

- (1) When the individual who discovers a fire must immediately go to the aid of an endangered person
- (2) During a malfunction of the building fire alarm system

Personnel hearing the code announced shall first activate the building fire alarm using the nearest manual fire alarm box and then shall execute immediately their duties as outlined in the fire safety plan. (**101:18.7.2.3; 101:19.7.2.3**)

8-4.2.3 Maintenance of Exits. Proper maintenance shall be provided to ensure the dependability of the method of evacuation selected. Health care occupancies that find it necessary to lock exits shall, at all times, maintain an adequate staff qualified to release locks and direct occupants from the immediate danger area to a place of safety in case of fire or other emergency. (**101:18.7.3; 101:19.7.3**)

8-4.2.4 Smoking. Smoking regulations shall be adopted and shall include not less than the following provisions:

- (1) Smoking shall be prohibited in any room, ward, or compartment where flammable liquids, combustible gases, or oxygen is used or stored and in any other hazardous location, and such areas shall be posted with signs that read NO SMOKING or shall be posted with the international symbol for no smoking.

Exception: In health care occupancies where smoking is prohibited and signs are prominently placed at all major entrances, secondary signs with language that prohibits smoking shall not be required.

- (2) Smoking by patients classified as not responsible shall be prohibited.

Exception: The requirement of 8-4.2.4(2) shall not apply where the patient is under direct supervision.

- (3) Ashtrays of noncombustible material and safe design shall be provided in all areas where smoking is permitted.
- (4) Metal containers with self-closing cover devices into which ashtrays can be emptied shall be readily available to all areas where smoking is permitted. (**101:18.7.4; 101:19.7.4**)

8-4.2.5 Furnishings, Bedding, and Decorations.

8-4.2.5.1 Draperies, curtains, including cubicle curtains, and other loosely hanging fabrics and films serving as furnishings or

decorations in health care occupancies shall be in accordance with the provisions of 8-4.2.5.2. (*See 18.3.5.5 of NFPA 101.*)

*Exception: Curtains at showers. (**101:18.7.5.1; 101:19.7.5.1**)*

8-4.2.5.2* Where required by the applicable provisions of this Code, draperies, curtains, and other similar loosely hanging furnishings and decorations shall be flame resistant as demonstrated by testing in accordance with NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*. (**101:10.3.1**)

8-4.2.5.3 Newly introduced upholstered furniture within health care occupancies shall meet the criteria specified when tested in accordance with the methods cited in 10.3.2(2) and 10.3.3 of NFPA 101. (**101:18.7.5.2; 101:19.7.5.2**)

8-4.2.5.4 Newly introduced mattresses within health care occupancies shall meet the criteria specified when tested in accordance with the methods cited in 10.3.2(3) and 10.3.4 of NFPA 101. (**101:18.7.5.3; 101:19.7.5.3**)

8-4.2.5.5 Combustible decorations shall be prohibited in any health care occupancy unless they are flame-retardant.

*Exception: Combustible decorations, such as photographs and paintings, in such limited quantities that a hazard of fire development or spread is not present. (**101:18.7.5.4; 101:19.7.5.4**)*

8-4.2.5.6 Soiled linen or trash collection receptacles shall not exceed 32 gal (121 L) in capacity. The average density of container capacity in a room or space shall not exceed 0.5 gal/ft² (20.4 L/m²). A capacity of 32 gal (121 L) shall not be exceeded within any 64-ft² (5.9-m²) area. Mobile soiled linen or trash collection receptacles with capacities greater than 32 gal (121 L) shall be located in a room protected as a hazardous area when not attended.

*Exception: Container size and density shall not be limited in hazardous areas. (**101:18.7.5.5; 101:19.7.5.5**)*

8-4.2.6 Portable Space Heating Devices. Portable space-heating devices shall be prohibited in all health care occupancies.

*Exception: Portable space-heating devices shall be permitted to be used in nonsleeping staff and employee areas where the heating elements of such devices do not exceed 212°F (100°C). (**101:18.7.8; 101:19.7.8**)*

8-5 Residential Board and Care Occupancies.

8-5.1 Application. New and existing residential board and care occupancies shall comply with this section and the referenced edition of NFPA 101.

8-5.2 Operating Features.

8-5.2.1 Emergency Plan. The administration of every residential board and care facility shall have, in effect and available to all supervisory personnel, written copies of a plan for protecting all persons in the event of fire, for keeping persons in place, for evacuating persons to areas of refuge, and for evacuating persons from the building when necessary. The plan shall include special staff response, including the fire protection procedures needed to ensure the safety of any resident, and shall be amended or revised whenever any resident with unusual needs is admitted to the home. All employees shall be periodically instructed and kept informed with respect to their duties and responsibilities under the plan. Such instruction shall be reviewed by the staff not less than every 2 months. A copy of the plan shall be readily available at all times within the facility. (**101:32.7.1; 101:33.7.1**)

8-5.2.2 Resident Training. All residents participating in the emergency plan shall be trained in the proper actions to be taken in the event of fire. This training shall include actions to be taken if the primary escape route is blocked. If the resident is given rehabilitation or habilitation training, training in fire prevention and the actions to be taken in the event of a fire shall be a part of the training program. Residents shall be trained to assist each other in case of fire to the extent that their physical and mental abilities permit them to do so without additional personal risk. (101:32.7.2; 101:33.7.2)

8-5.2.3 Emergency Egress and Relocation Drills. Emergency egress and relocation drills shall be conducted not less than six times per year on a bimonthly basis, with not less than two drills conducted during the night when residents are sleeping. The drills shall be permitted to be announced in advance to the residents. The drills shall involve the actual evacuation of all residents to an assembly point as specified in the emergency plan and shall provide residents with experience in egressing through all exits and means of escape required by the Code. Exits and means of escape not used in any drill shall not be credited in meeting the requirements of this Code for board and care facilities.

Exception No. 1: Actual exiting from windows shall not be required to comply with 8-5.2.3; opening the window and signaling for help shall be an acceptable alternative.

Exception No. 2: If the board and care facility has an evacuation capability classification of impractical, those residents who cannot meaningfully assist in their own evacuation or who have special health problems shall not be required to actively participate in the drill. Section 18.7 of NFPA 101 shall apply in such instances. (101:32.7.3; 101:33.7.3)

8-5.2.4 Smoking.

8-5.2.4.1* Smoking regulations shall be adopted by the administration of board and care occupancies. (101:32.7.4.1; 101:33.7.4.1)

8-5.2.4.2 Where smoking is permitted, noncombustible safety-type ashtrays or receptacles shall be provided in convenient locations. (101:32.7.4.2; 101:33.7.4.2)

8-5.2.5 Furnishings, Bedding, and Decorations.

8-5.2.5.1 New draperies, curtains, and other similar loosely hanging furnishings and decorations in board and care facilities shall be in accordance with the provisions of 8-5.2.5.2. (101:32.7.5.1; 101:33.7.5.1)

8-5.2.5.2 Where required by the applicable provisions of this Code, draperies, curtains, and other similar loosely hanging furnishings and decorations shall be flame resistant as demonstrated by testing in accordance with NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*. (101:10.3.1)

8-5.2.5.3* New upholstered furniture within board and care facilities shall be tested in accordance with the provisions of 10.3.2(1) and 10.3.3 of NFPA 101.

Exception: Upholstered furniture belonging to the resident in sleeping rooms, provided that a smoke alarm is installed in such rooms. Battery-powered single-station smoke alarms shall be permitted. (101:32.7.5.2; 101:33.7.5.2)

8-5.2.5.4* New mattresses within board and care facilities shall be tested in accordance with the provisions of 10.3.2(3) and 10.3.4 of NFPA 101.

Exception: Mattresses belonging to the resident in sleeping rooms, provided that a smoke alarm is installed in such rooms. Battery-powered single-station smoke alarms shall be permitted. (101:32.7.5.3; 101:33.7.5.3)

8-6 Ambulatory Health Care Centers.

8-6.1 Application. New and existing ambulatory health care centers shall comply with this section and the referenced edition of NFPA 101.

8-6.2 Operating Features.

8-6.2.1 Evacuation and Relocation Plan and Fire Drills.

8-6.2.1.1 The administration of every ambulatory health care facility shall have, in effect and available to all supervisory personnel, written copies of a plan for the protection of all persons in the event of fire, for their evacuation to areas of refuge, and for their evacuation from the building when necessary. All employees shall be periodically instructed and kept informed with respect to their duties under the plan. A copy of the plan shall be readily available at all times in the telephone operator's position or at the security center.

The provisions of 8-6.2.1.2 through 8-6.2.2.3 shall apply. (101:20.7.1.1; 101:21.7.1.1)

8-6.2.1.2 Fire drills in ambulatory health care facilities shall include the transmission of a fire alarm signal and simulation of emergency fire conditions. Drills shall be conducted quarterly on each shift to familiarize facility personnel (nurses, interns, maintenance engineers, and administrative staff) with the signals and emergency action required under varied conditions. When drills are conducted between 9:00 p.m. (2100 hours) and 6:00 a.m. (0600 hours), a coded announcement shall be permitted to be used instead of audible alarms.

Exception: Infirm or bedridden patients shall not be required to be moved during drills to safe areas or to the exterior of the building. (101:20.7.1.2; 101:21.7.1.2)

8-6.2.1.3 Employees of ambulatory health care facilities shall be instructed in life safety procedures and devices. (101:20.7.1.3; 101:21.7.1.3)

8-6.2.2 Procedure in Case of Fire.

8-6.2.2.1 For ambulatory health care facilities, the proper protection of patients shall require the prompt and effective response of ambulatory health care personnel. The basic response required of staff shall include the removal of all occupants directly involved with the fire emergency, transmission of an appropriate fire alarm signal to warn other building occupants and summon staff, confinement of the effects of the fire by closing doors to isolate the fire area, and the relocation of patients as detailed in the facility's fire safety plan. (101:20.7.2.1; 101:21.7.2.1)

8-6.2.2.2 A written fire safety plan shall provide for the following:

- (1) Use of alarms
 - (2) Transmission of alarm to fire department
 - (3) Response to alarms
 - (4) Isolation of fire
 - (5) Evacuation of immediate area
 - (6) Evacuation of smoke compartment
 - (7) Preparation of floors and building for evacuation
 - (8) Extinguishment of fire
- (101:20.7.2.2; 101:21.7.2.2)

8-6.2.2.3 All personnel shall be instructed in the use of and response to fire alarms. In addition, they shall be instructed in the use of the code phrase to ensure transmission of an alarm under the following conditions:

- (1) When the individual who discovers a fire must immediately go to the aid of an endangered person
- (2) During a malfunction of the building fire alarm system

Personnel hearing the code announced shall first activate the building fire alarm using the nearest fire alarm box and then shall execute immediately their duties as outlined in the fire safety plan. (*101:20.7.2.3; 101:21.7.2.3*)

8-6.2.3 Maintenance of Exits. Proper maintenance shall be provided to ensure the dependability of the method of evacuation selected. Ambulatory health care occupancies that find it necessary to lock exits shall, at all times, maintain an adequate staff qualified to release locks and direct occupants from the immediate danger area to a place of safety in case of fire or other emergency. (*101:20.7.3; 101:21.7.3*)

8-6.2.4* Smoking. Smoking regulations shall be adopted and shall include not less than the following provisions:

- (1) Smoking shall be prohibited in any room, ward, or compartment where flammable liquids, combustible gases, or oxygen is used or stored and in any other hazardous location, and such areas shall be posted with signs that read NO SMOKING or shall be posted with the international symbol for no smoking.

Exception: The requirement of 8-6.2.4(1) shall not apply where smoking is prohibited and signs are prominently placed at all major entrances, secondary signs with language that prohibits smoking shall not be required.

- (2) Smoking by patients classified as not responsible shall be prohibited.

Exception: The requirement of 8-6.2.4(2) shall not apply where the patient is under direct supervision.

- (3) Ashtrays of noncombustible material and safe design shall be provided in all areas where smoking is permitted.
- (4) Metal containers with self-closing cover devices into which ashtrays can be emptied shall be readily available to all areas where smoking is permitted. (*101:20.7.4; 101:21.7.4*)

8-6.2.5 Furnishings, Bedding, and Decorations.

8-6.2.5.1 Draperies, curtains, including cubicle curtains, and other loosely hanging fabrics and films serving as furnishings or decorations in ambulatory health care occupancies shall be in accordance with the provisions of 8-6.2.5.2.

Exception: Curtains at showers. (101:20.7.5.1; 101:21.7.5.1)

8-6.2.5.2 Where required by the applicable provisions of this Code, draperies, curtains, and other similar loosely hanging furnishings and decorations shall be flame resistant as demonstrated by testing in accordance with NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*. (*101:10.3.1*)

8-6.2.5.3 Newly introduced upholstered furniture shall meet the criteria specified when tested in accordance with the methods cited in 10.3.2(2) and 10.3.3 of NFPA 101. (*101:20.7.5.2; 101:21.7.5.2*)

8-6.2.5.4 Newly introduced mattresses shall meet the criteria specified when tested in accordance with the methods cited in 10.3.2(3) and 10.3.4 of NFPA 101. (*101:20.7.5.3; 101:21.7.5.3*)

8-6.2.5.5 Combustible decorations shall be prohibited unless they are flame-retardant.

Exception: Combustible decorations, such as photographs and paintings, in such limited quantities that a hazard of fire development or spread is not present. (101:20.7.5.4; 101:21.7.5.4)

8-6.2.6 Portable Space-Heating Devices. Portable space-heating devices shall be prohibited.

Exception: Portable space-heating devices shall be permitted to be used in nonsleeping staff and employee areas where the heating elements of such devices do not exceed 212°F (100°C). (101:20.7.8; 101:21.7.8)

8-7 Detention and Correctional Occupancies.

8-7.1 Application. New and existing detention and correctional occupancies shall comply with this section and the referenced edition of NFPA 101.

8-7.2 Operating Features.

8-7.2.1 Attendants, Evacuation Plan, Fire Drills.

8-7.2.1.1 Detention and correctional facilities, or those portions of facilities having such occupancy, shall be provided with 24-hour staffing. Staff shall be within three floors or a 300-ft (91-m) horizontal distance of the access door of each resident housing area.

In addition, for Use Condition III, Use Condition IV, and Use Condition V, the arrangement shall be such that the staff involved starts the release of locks necessary for emergency evacuation or rescue and initiates other necessary emergency actions within 2 minutes of alarm.

Exception: For areas in which all locks are unlocked remotely in compliance with 22.2.11.6 of NFPA 101, staff shall not be required to be within three floors or 300 ft (104 m) of the access door. The exception to 22.2.11.6 of NFPA 101 shall not be used in conjunction with this exception. (101:22.7.1.1; 101:23.7.1.1)

8-7.2.1.2* Provisions shall be made so that residents in Use Condition III, Use Condition IV, and Use Condition V shall be able to notify staff of an emergency. (*101:22.7.1.2; 101:23.7.1.2*)

8-7.2.1.3* The administration of every detention or correctional facility shall have, in effect and available to all supervisory personnel, written copies of a plan for the protection of all persons in the event of fire, for their evacuation to areas of refuge, and for evacuation from the building when necessary. All employees shall be instructed and drilled with respect to their duties under the plan. The plan shall be coordinated with and reviewed by the fire department legally committed to serve the facility. (*101:22.7.1.3; 101:23.7.1.3*)

8-7.2.1.4 Employees of detention and correctional occupancies shall be instructed in the proper use of portable fire extinguishers and other manual fire suppression equipment. Such training shall be provided to new staff promptly upon commencement of duty. Refresher training shall be provided to existing staff at not less than annual intervals. (*101:22.7.1.4; 101:23.7.1.4*)

8-7.2.2 Books, clothing, and other combustible personal property allowed in sleeping rooms shall be stored in closable metal lockers or a fire-resistant container. (*101:22.7.2; 101:23.7.2*)

8-7.2.3 The number of heat-producing appliances, such as toasters and hot plates, and the overall use of electrical power

within a sleeping room shall be controlled by facility administration. (*101:22.7.3; 101:23.7.3*)

8-7.2.4 Furnishings, Bedding, and Decorations.

8-7.2.4.1 Draperies and curtains, including privacy curtains, in detention and correctional occupancies shall be in accordance with the provisions of 8-7.2.4.2.

8-7.2.4.2 Where required by the applicable provisions of this Code, draperies, curtains, and other similar loosely hanging furnishings and decorations shall be flame resistant as demonstrated by testing in accordance with NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*. (*101:10.3.1*)

8-7.2.4.3 Combustible decorations shall be prohibited in any detention or correctional occupancy unless flame-retardant. (*101:22.7.4.4; 101:23.7.4.4*)

8-7.2.4.4 Wastebaskets and other waste containers shall be of noncombustible or other approved materials. Waste containers with a capacity exceeding 20 gal (76 L) shall be provided with a noncombustible lid or lid of other approved material. (*101:22.7.4.5; 101:23.7.4.5*)

8-7.2.5 Keys. All keys necessary for unlocking doors installed in a means of egress shall be individually identified by both touch and sight. (*101:22.7.5; 101:23.7.5*)

8-7.2.6 Portable Space-Heating Devices. Portable space-heating devices shall be prohibited in all detention and correctional occupancies. (*101:22.7.6; 101:23.7.6*)

8-8 Hotels and Dormitories.

8-8.1 Application. New and existing hotels and dormitories shall comply with this section and the referenced edition of NFPA 101.

8-8.2 Operating Features.

8-8.2.1 Hotel Emergency Organization.

8-8.2.1.1 Employees of hotels shall be instructed and drilled in the duties they are to perform in the event of fire, panic, or other emergency.

8-8.2.1.2 Drills of the emergency organization shall be held at quarterly intervals and shall cover such points as the operation and maintenance of the available first aid fire appliances, the testing of devices to alert guests, and a study of instructions for emergency duties (*101:28.7.1.2; 101:29.7.1.2*)

8-8.2.2 Emergency Duties. Upon discovery of a fire, employees shall carry out the following duties:

- (1) Activate the facility fire protection signaling system, if provided
- (2) Notify the public fire department
- (3) Take other action as previously instructed (*101:28.7.2; 101:29.7.2*)

8-8.2.3 Drills in Dormitories. Emergency egress and relocation drills shall be regularly conducted in accordance with 8-8.2.3.1 through 8-8.2.3.6. (*101:28.7.3; 101:29.7.3*)

8-8.2.3.1 Emergency egress and relocation drills conforming to the provisions of this Code shall be conducted as specified by the provisions of Chapters 11 through 42 of NFPA 101, or by appropriate action of the authority having jurisdiction. Drills shall be designed in cooperation with the local authorities. (*101:4.7.1*)

8-8.2.3.2 Emergency egress and relocation drills, where required by Chapters 11 through 42 of NFPA 101 or the authority having jurisdiction, shall be held with sufficient frequency to familiarize occupants with the drill procedure and to establish conduct of the drill as a matter of routine. Drills shall include suitable procedures to ensure that all persons subject to the drill participate. (*101:4.7.2*)

8-8.2.3.3 Responsibility for the planning and conduct of drills shall be assigned only to competent persons qualified to exercise leadership. (*101:4.7.3*)

8-8.2.3.4 In the conduct of drills, emphasis shall be placed on orderly evacuation rather than on speed. (*101:4.7.4*)

8-8.2.3.5 Drills shall be held at expected and unexpected times and under varying conditions to simulate the unusual conditions that can occur in an actual emergency. (*101:4.7.5*)

8-8.2.3.6 Drill participants shall relocate to a predetermined location and remain at such location until a recall or dismissal signal is given. (*101:4.7.6*)

8-8.2.4 Emergency Instructions for Residents or Guests.

8-8.2.4.1 A floor diagram reflecting the actual floor arrangement, exit locations, and room identification shall be posted in a location and manner acceptable to the authority having jurisdiction on, or immediately adjacent to, every guest room door in hotels and in every resident room in dormitories. (*101:28.7.4.1; 101:29.7.4.1*)

8-8.2.4.2 Fire safety information shall be provided to allow guests to make the decision to evacuate to the outside, to evacuate to an area of refuge, to remain in place, or to employ any combination of the three options. (*101:28.7.4.2; 101:29.7.4.2*)

8-8.2.5 Furnishings and Decorations.

8-8.2.5.1* New draperies, curtains, and other similar loosely hanging furnishings and decorations in hotels and dormitories shall be in accordance with the provisions of 8-8.2.5.2. (*101:28.3.3.4; 101:29.3.3.4*)

8-8.2.5.2 Where required by the applicable provisions of this Code, draperies, curtains, and other similar loosely hanging furnishings and decorations shall be flame resistant as demonstrated by testing in accordance with NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*. (*101:10.3.1*)

8-8.2.6 Fuel-Fired Heaters. Unvented fuel-fired heaters shall not be used.

Exception: Gas space heaters in compliance with NFPA 54, National Fuel Gas Code. (101:28.5.2.2; 101:29.5.2.2)

8-9 Apartment Buildings.

8-9.1 Application. New and existing apartment buildings shall comply with this section and the referenced edition of NFPA 101.

8-9.2 Operating Features.

8-9.2.1 Emergency instructions shall be provided annually to each dwelling unit to indicate the location of alarms, egress paths, and actions to be taken, both in response to a fire in the dwelling unit and in response to the sounding of the alarm system. (*101:30.7.1; 101:31.7.1*)

8-9.2.2 Fuel-Fired Heaters. Unvented fuel-fired heaters shall not be used.

Exception: Gas space heaters in compliance with NFPA 54, National Fuel Gas Code. (101:30.5.2.2; 101:31.5.2.2)

8-10 Lodging or Rooming Houses.

8-10.1 Application. New and existing lodging or rooming houses shall comply with this section and the referenced edition of NFPA 101.

8-10.2 Fuel-Fired Heaters. Unvented fuel-fired heaters shall not be used.

Exception: Gas space heaters in compliance with NFPA 54, National Fuel Gas Code. (101:26.5.2.2)

8-11 One- and Two-Family Dwellings and Manufactured Housing.

8-11.1 Application. New and existing one- and two-family dwellings shall comply with this section and the referenced edition of NFPA 101.

8-11.2 Fuel-Fired Heaters. Unvented fuel-fired heaters shall not be used.

Exception: Listed and approved unvented fuel-fired heaters in one- and two-family dwellings. (101:24.5.1.2)

8-11.3 Manufactured Housing. New manufactured housing shall comply with this section and the referenced edition of NFPA 501, *Standard on Manufactured Housing*.

8-12 Mercantile Occupancies.

8-12.1 Application.

8-12.1.1 New and existing mercantile occupancies shall comply with this section and the referenced edition of NFPA 101.

8-12.2 Operating Features.

8-12.2.1 Drills.

8-12.2.1.1 In every Class A or Class B mercantile occupancy, employees shall be periodically trained in accordance with 8-12.2.1.2 through 8-12.2.1.7. (101:36.7.1; 101:37.7.1)

8-12.2.1.2 Emergency egress and relocation drills conforming to the provisions of this Code shall be conducted as specified by the provisions of Chapters 11 through 42 of NFPA 101, or by appropriate action of the authority having jurisdiction. Drills shall be designed in cooperation with the local authorities. (101:4.7.1)

8-12.2.1.3 Emergency egress and relocation drills, where required by Chapters 11 through 42 of NFPA 101 or the authority having jurisdiction, shall be held with sufficient frequency to familiarize occupants with the drill procedure and to establish conduct of the drill as a matter of routine. Drills shall include suitable procedures to ensure that all persons subject to the drill participate. (101:4.7.2)

8-12.2.1.4 Responsibility for the planning and conduct of drills shall be assigned only to competent persons qualified to exercise leadership. (101:4.7.3)

8-12.2.1.5 In the conduct of drills, emphasis shall be placed on orderly evacuation rather than on speed. (101:4.7.4)

8-12.2.1.6 Drills shall be held at expected and unexpected times and under varying conditions to simulate the unusual conditions that can occur in an actual emergency. (101:4.7.5)

8-12.2.1.7 Drill participants shall relocate to a predetermined location and remain at such location until a recall or dismissal signal is given. (101:4.7.6)

8-12.2.2 Extinguisher Training. Employees of mercantile occupancies shall be periodically instructed in the use of portable fire extinguishers. (101:36.7.2; 101:37.7.2)

8-13 Business Occupancies.

8-13.1 Application. New and existing business occupancies shall comply with this section and the referenced edition of NFPA 101.

8-13.2 Operating Features.

8-13.2.1 Drills.

8-13.2.1.1 In any business occupancy building occupied by more than 500 persons or more than 100 persons above or below the street level, employees and supervisory personnel shall be periodically instructed in accordance with 8-13.2.1.2 through 8-13.2.1.7 and shall hold drills periodically where practicable. (101:38.7.1; 101:39.7.1)

8-13.2.1.2 Emergency egress and relocation drills conforming to the provisions of this Code shall be conducted as specified by the provisions of Chapters 11 through 42 of NFPA 101, or by appropriate action of the authority having jurisdiction. Drills shall be designed in cooperation with the local authorities. (101:4.7.1)

8-13.2.1.3 Emergency egress and relocation drills, where required by Chapters 11 through 42 of NFPA 101 or the authority having jurisdiction, shall be held with sufficient frequency to familiarize occupants with the drill procedure and to establish conduct of the drill as a matter of routine. Drills shall include suitable procedures to ensure that all persons subject to the drill participate. (101:4.7.2)

8-13.2.1.4 Responsibility for the planning and conduct of drills shall be assigned only to competent persons qualified to exercise leadership. (101:4.7.3)

8-13.2.1.5 In the conduct of drills, emphasis shall be placed on orderly evacuation rather than on speed. (101:4.7.4)

8-13.2.1.6 Drills shall be held at expected and unexpected times and under varying conditions to simulate the unusual conditions that can occur in an actual emergency. (101:4.7.5)

8-13.2.1.7 Drill participants shall relocate to a predetermined location and remain at such location until a recall or dismissal signal is given. (101:4.7.6)

8-13.2.2 Extinguisher Training. Designated employees of business occupancies shall be periodically instructed in the use of portable fire extinguishers. (101:38.7.2; 101:39.7.2)

8-14 Industrial Occupancies, Application. New and existing industrial occupancies shall comply with this section and the referenced edition of NFPA 101.

8-15 Storage Occupancies.

8-15.1 Application. New and existing storage occupancies shall comply with this section, appropriate codes or standards referenced in Chapter 32 and NFPA 101.

8-15.2 Special Provisions.

8-15.2.1* The storage of combustibles up to 30 ft (9 m), or the storage of plastics (Group B and Group C — all configurations; Group A — free-flowing only) up to 30 ft (9 m) in height, or the storage of Group A plastics (except free-flowing) up to 25 ft (7.6 m) in height shall comply with Section 8-15, NFPA 13, *Standard for the Installation of Sprinkler Systems*, and NFPA 230, *Standard for the Fire Protection of Storage*.

Exception: Existing buildings.

8-15.2.2 The storage of combustibles stored over 12 ft (3.7 m) in height on racks shall comply with Section 8-15, NFPA 13, *Standard for the Installation of Sprinkler Systems*, and NFPA 230, *Standard for the Fire Protection of Storage*.

Exception: Existing buildings.

8-15.3 Bulk Storage Elevators. Bulk storage elevators shall comply with 8-15.3 and NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Products Facilities*.

8-15.3.1 Bulk storage elevators shall include all of the following:

- (1) All facilities that handle, process, use, blend, mill, receive, load, ship, package, store, or unload dry agricultural bulk materials, their by-products, or dusts that include grains, oilseeds, agricultural seeds, legumes, sugar, flour, spices, feeds, and other related materials
- (2) All facilities designed for manufacturing and handling starch, including drying, grinding, conveying, processing, packaging, and storage of dry or modified starch, and dry products and dusts generated from these processes
- (3) Those seed preparation and meal-handling systems of oilseed processing plants not covered by NFPA 36, *Standard for Solvent Extraction Plants* (61:1-1.1)

8-15.3.2 NFPA 61 shall not apply to oilseed extraction plants that are covered by NFPA 36, *Standard for Solvent Extraction Plants*. (61:1-1.2)

8-15.3.3 Applicability. Unless otherwise noted, the provisions of 8-15.3 on bulk storage elevators shall not be applied to facilities, equipment, structures, or installations that were existing or approved for construction or installation prior to the effective date of this Code, except in those cases where it is deter-

mined by the authority having jurisdiction that the existing situation involves a distinct hazard to life or adjacent property.

Exception: The requirements of Chapter 11 of NFPA 61, Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Products Facilities, shall apply to all facilities.

8-15.4 Rubber Tire Storage.

8-15.4.1 Storage of rubber tires shall comply with NFPA 231D, *Standard for Storage of Rubber Tires*.

Exception: Existing buildings.

8-15.4.2 Permits. Permits, where required, shall comply with Section 1-16.

8-15.5 Record Storage.

8-15.5.1 Records protection equipment, facilities, and records handling techniques that provide protection from the hazards of fire shall comply with this section and NFPA 232, *Standard for the Protection of Records*.

8-15.5.2* Because of the volume of records, 8-15.5.1 shall not cover large archives or records storage buildings.

8-15.6 Cellulose Nitrate Motion Picture Film Storage. The storage and handling of cellulose nitrate film records shall comply with this section and NFPA 40, *Standard for the Storage and Handling of Cellulose Nitrate Motion Picture Film*.

8-16 Special Structures and High-Rise Buildings, Application. New and existing special structures and high-rise buildings shall comply with the referenced edition of NFPA 101. Motion picture and television production studio soundstages and approved production facilities shall comply with NFPA 140, *Standard on Motion Pictures and Television Production Studio Soundstages and Approved Production Facilities*.

8-17 Historical Buildings.

8-17.1 The provisions of this Code relating to the construction, repair, alteration, enlargement, restoration, and moving of buildings or structures shall not be mandatory for existing buildings or structures identified and classified by the state or local government authority as historic buildings where such buildings are judged by the authority having jurisdiction to be safe and to not constitute a serious life safety hazard.

8-17.2* Historic buildings shall comply with NFPA 909, *Standard for the Protection of Cultural Resources, Including Museums, Libraries, Places of Worship, and Historic Properties*.

Chapter 9 Aerosol Products

9-1 Application.

9-1.1 The manufacture, storage, and display of aerosol products shall be in accordance with this chapter and NFPA 30B, *Code for the Manufacture and Storage of Aerosol Products*.

9-1.2 This chapter shall not apply to the following:

- (1) *The manufacture, storage, and display of aerosol products that contain only a nonflammable base product and a nonflammable propellant. (30B:1-1.2)
- (2) *The storage and display of containers whose contents are comprised entirely of LP-Gas products. (30B:1-1.3)

Chapter 10 Airports and Heliports

10-1 Hangars. The construction and protection of aircraft hangars from fire shall comply with this section and NFPA 409, *Standard on Aircraft Hangars*.

10-2 Terminals.

10-2.1 Application. Airport terminal buildings shall comply with the requirements of this section and NFPA 415, *Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways*.

10-2.2 General.

10-2.2.1* Airport terminal buildings shall be of Type I, Type II, or Type IV construction, as defined in NFPA 220, *Standard on Types of Building Construction*. (415:2-1.1)

10-2.2.2* Interior finish shall be limited to that permitted in Class A places of assembly as specified in NFPA 101®, *Life Safety Code*®. (415:2-1.2)

10-2.2.3 Below grade areas or blind spaces in airport terminal buildings shall be protected against flammable fuel or vapor penetration or shall be mechanically ventilated to provide at least four complete air changes per hour. The mechanical ventilation system shall be installed in accordance with Chapters 2 and 3 of NFPA 91, *Standard for Exhaust Systems for Air Conveying of Materials*. (415:2-1.4)

10-2.3 Heating, Ventilating, Air Conditioning.

10-2.3.1* Air supply intake and exhaust openings for air conditioning or ventilating equipment serving the terminal building, if located on the ramp side, shall be not less than 10 ft (3 m) above the grade level of the ramp and shall be at least 50 ft (15.2 m) from any point of flammable vapor release. (415:2-2.2)

10-2.3.2* Openings to rooms containing coal-, gas-, or oil-fired equipment, or any rooms containing any other open flame device, that face the ramp side of the terminal shall be above ramp grade and 50 ft (15.2 m) from any point of flammable vapor release. (415:2-2.3)

10-2.3.3 Stacks or chimneys from a boiler, heater, or incinerator shall terminate at least 20 ft (6.1 m) above ramp grade and above the roof of the building. Stacks or chimneys from boilers or heaters using solid fuel or from any incinerator shall be fitted with double screening to control fly ash and sparks. Such stacks or chimneys shall be located so the outlet is at least

100 ft (30.5 m) horizontally from any aircraft position or point of flammable vapor release. (415:2-2.4)

10-2.4* Exits. Exits that discharge onto an airport ramp and are provided solely for the purpose of meeting emergency egress requirements from public areas shall be placarded "Emergency Exit Only" in letters at least 2 in. (4.9 cm) high. (415:2-3.2)

10-2.5 Fire Protection.

10-2.5.1 Fire Hydrants. Fire hydrants shall be provided on both the ramp and street sides of airport terminal buildings. Such hydrants shall be located so that no portion of the terminal building is more than 500 ft (152.4 m) from a hydrant. (415:2-5.3)

10-2.5.2 Standpipe and Hose Systems. Standpipe and hose systems shall be provided for all airport terminal buildings in excess of two stories [35 ft (10.7 m)] in height or 100 ft (30.5 m) in shortest horizontal dimension. Standpipe and hose systems shall be installed in accordance with NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*. (415:2-5.4)

10-2.5.2.1 Class I standpipe systems shall be provided in buildings protected throughout by an approved automatic sprinkler system. Each 2½-in. (65 mm) hose connection shall be equipped with a 2½-in. × 1½-in. (65-mm × 38-mm) reducer and cap. (415:2-5.4.1)

10-2.5.2.2 Class III standpipe systems shall be provided in nonsprinklered buildings. The exceptions in NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*, for Class III systems shall be applicable to this requirement. (415:2-5.4.2)

10-2.5.3 Water Supply. Water supply from public or private sources shall be adequate to supply maximum calculated sprinkler demand plus a minimum of 500 gpm (1893 L/min) for hose streams. The supply shall be available at the rate specified for a period of at least 1 hour. (415:2-5.5)

10-2.5.4 Fire Alarm System. Means to alert the public fire department or the airport fire station shall be available through manual fire alarm pull stations. Manual fire alarm services shall be installed in accordance with NFPA 72, *National Fire Alarm Code*. (415:2-5.2.1)

10-2.5.5 Portable Fire Extinguishers. Portable fire extinguishers shall be provided throughout the airport terminal building in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*. (415:2-5.6)

10-2.6 Covered Plane-Loading Positions. Airport terminal buildings having canopy areas or roofed-over recesses at aircraft loading positions that, in effect, place the aircraft totally or substantially under such canopies or roofs shall have these canopies or roofs protected by automatic sprinkler systems in accordance with NFPA 409, *Standard on Aircraft Hangars*. (415:2-5.1.3)

10-3 Roof-Top Heliport Construction and Protection.

10-3.1 Application. Rooftop heliport construction and protection shall comply with this section and NFPA 418, *Standard for Heliports*.

10-3.2 Structural Support. Main structural support members that could be exposed to a fuel spill shall be made fire resistant

using listed materials and methods to provide a fire-resistance rating of not less than 2 hours. (418:3-1)

10-3.3 Landing Pad Pitch. The rooftop landing pad shall be pitched to provide drainage that flows away from passenger holding areas, access points, stairways, elevator shafts, ramps, hatches, and other openings. (418:3-2)

10-3.4 Landing Pad Construction Materials. The rooftop landing pad surface shall be constructed of noncombustible, nonporous materials that are approved. The contiguous building roof covering within 50 ft (15.2 m) of the landing pad edge shall have a Class A rating. (418:3-3)

10-3.5* Means of Egress. At least two approved means of egress from the rooftop landing pad edge shall be provided and shall be remotely located from each other to the extent practical. (418:3-4)

10-3.5.1 For heliports occupied by 50 or more people, two approved means of egress from the roof shall be provided and shall be remotely located from each other to the extent practical but shall not be located less than 30 ft (9.1 m) from each other. For heliports occupied by fewer than 50 people, one approved means of egress from the roof shall be provided. (418:3-4.1)

10-3.5.2 Means of egress from the rooftop landing pad and roof shall not obstruct flight operations. (418:3-4.2)

10-3.6 Fire-Fighting Access. The helicopter rooftop landing pad shall have at least two access points for fire-fighting purposes. Access for fire-fighting personnel through the landing pad egress shall be permitted. (418:3-5)

10-3.7 Fire Protection. A foam fire extinguishing system shall be designed and installed to protect the rooftop landing pad.

Exception No. 1: A foam fire extinguishing system shall not be required for heliports located on parking garages, unoccupied buildings, or other similar unoccupied structures.

Exception No. 2: For H-1 heliports, two portable foam extinguishers, each having a rating of 20-A:160-B, shall be permitted to be used to satisfy this requirement. (418:3-6)

10-3.7.1* The foam discharge rate shall be as follows:

| | |
|---------------|--|
| AFFF | 0.10 gpm/ft ² [4.1 (L/min)/m ²] |
| Fluoroprotein | 0.16 gpm/ft ² [6.5 (L/min)/m ²] |
| Protein | 0.20 gpm/ft ² [8.1 (L/min)/m ²] |

(418:3-6.1)

10-3.7.2 The area of application of foam discharge for fixed discharge outlet systems shall be the entire rooftop landing pad. The duration shall be 5 minutes. (418:3-6.2)

10-3.7.3* The area of application of foam discharge for hose line systems shall be the practical critical fire area, as shown in Table 10-3.7.3, for the category of the helicopter landing facility. The duration shall be 2 minutes. (418:3-6.3)

Table 10-3.7.3 Practical Critical Fire Areas

| Category | Helicopter Overall Length* | Practical Critical Fire Area |
|----------|---|--|
| H-1 | Up to but not including 50 ft (15.2 m) | 375 ft ² (34.8 m ²) |
| H-2 | From 50 ft (15.2 m) up to but not including 80 ft (24.4 m) | 840 ft ² (78.0 m ²) |
| H-3 | From 80 ft (24.4 m) up to but not including 120 ft (36.6 m) | 1440 ft ² (133.8 m ²) |

*Helicopter length, including the tail boom and the rotors. (418:Table 3-6.3)

10-3.7.4 The water supply for the foam system shall be from a reliable source, approved by the authority having jurisdiction. (418:3-6.4)

10-3.7.4.1 Fire pumps, if used, shall be installed in accordance with NFPA 20, *Standard for the Installation of Centrifugal Fire Pumps*. (418:3-6.4.1)

10-3.7.4.2 Standpipes and hose stations, if used, shall be installed in accordance with NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*. (418:3-6.4.2)

10-3.7.4.3 Where freezing is possible, adequate freeze protection shall be provided. (418:3-6.4.3)

10-3.7.5 The foam components shall be installed in a readily accessible area of the heliport and shall not penetrate the primary, approach, departure, and transitional surfaces defined in paragraphs 3J, 3K, 3L, 13, and 21 of FAA A/C 150/5390-2, *Heliport Design Advisory Circular*. (418:3-6.5)

10-3.7.6 At facilities where there is more than one rooftop landing pad, the supply of foam available shall be sufficient to cover an incident on at least one of the pads. (418:3-6.6)

10-3.7.7 Where fixed foam systems utilizing fixed deck nozzles or oscillating foam turrets, or both, are installed, system components shall be listed or approved. (418:3-6.7)

10-3.8 Standpipes. If a building with a rooftop heliport is supplied with a standpipe system, a Class II standpipe shall be extended to the roof level on which the rooftop heliport is located. Such standpipe systems shall be installed in accordance with NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*. (418:3-7)

10-3.9 Fire Alarm. Where buildings are provided with a fire alarm system, a manual pull station shall be provided for each designated means of egress from the roof. (See 10-3.5.1.) (418:3-8)

10-3.10 Portable Fire Extinguishers.

10-3.10.1 Quantity and Rating. At least one portable fire extinguisher as specified in Table 10-3.10.1 shall be provided for each takeoff and landing area, parking area, and fuel storage area.

Exception: This requirement shall not apply to unattended ground level heliports. (418:5-1)

Table 10-3.10.1 Minimum Ratings of Portable Fire Extinguishers for Heliport Categories

| Category | Helicopter Overall Length* | Minimum Rating |
|----------|---|----------------|
| H-1 | Up to but not including 50 ft (15.2 m) | 4-A:80-B |
| H-2 | From 50 ft (15.2 m) up to, but not including, 80 ft (24.4 m) | 10-A:120-B |
| H-3 | From 80 ft (24.4 m) up to, but not including, 120 ft (36.6 m) | 30-A:240-B |

*Helicopter length, including the tail boom and the rotors.
(418:Table 5-1)

10-3.10.2 Servicing. Portable fire extinguishers shall comply with NFPA 10, *Standard for Portable Fire Extinguishers*, Chapters 1, 4, 5, and 6. (418:5-2)

Chapter 11 Cleanrooms

11-1 General. All semiconductor facilities containing a cleanroom or a clean zone, or both, shall comply with this chapter and NFPA 318, *Standard for the Protection of Cleanrooms*.

11-2 Applicability. Unless otherwise noted in NFPA 318, it is not intended that the provisions of NFPA 318 be applied to facilities, equipment, structures, or installations that were existing or approved for construction or installation prior to the effective date of this Code, except in those cases where it is determined by the authority having jurisdiction that the existing situation involves a distinct hazard to life or adjacent property.

Chapter 12 Combustible Waste, Refuse, and Fibers

12-1 Combustible Waste and Refuse.

12-1.1 No person owning or having control of any property shall allow any combustible waste material to accumulate in any area or in any manner that creates a fire hazard to life or property.

12-1.2 Combustible waste or refuse shall be properly stored or disposed of to prevent unsafe conditions.

12-1.3 Fire extinguishing capabilities approved by the authority having jurisdiction shall be provided at waste disposal sites including, but not limited to, fire extinguishers, water supply and hose, and earth-moving equipment.

12-1.4 Burning debris shall not be dumped at a waste disposal site except at a remote location on the site where fire extinguishment can be accomplished before compacting, covering, or other disposal activity is carried out.

12-1.5 Vehicles or conveyances used to transport combustible waste or refuse over public thoroughfares shall have all cargo space covered and maintained tight enough to ensure against ignition from external fire sources and scattering burning and combustible debris that can come in contact with ignition sources. Transporting burning waste or refuse shall be prohibited.

12-2 Combustible Fibers.

12-2.1 Application.

12-2.1.1 All facilities handling or storing combustible fibers shall comply with this section.

12-2.1.2 This section shall not apply to buildings completely protected by an approved automatic fire extinguishing system; however, this does not preclude the need for good housekeeping.

12-2.1.3 Permits. Permits, where required, shall comply with Section 1-16.

12-2.2 Loose Storage of Combustible Fibers.

12-2.2.1 Loose combustible fibers (not in suitable bales or packages), whether housed or in the open, shall not be stored within 100 ft (30 m) of any building, except as hereinafter specified.

12-2.2.2 Quantities of loose combustible fibers up to 100 ft³ (2.83 m³) shall not be kept in any building unless stored in a metal or metal-lined bin that is equipped with a self-closing cover.

12-2.2.3 Quantities exceeding 100 ft³ (2.83 m³) of loose combustible fibers, but not exceeding 500 ft³ (14.2 m³), shall be permitted to be stored in rooms or compartments in which the floors, walls, and ceilings have a fire resistance rating of not less than 1 hour. Each opening into such rooms or compartments from other parts of the building shall be equipped with an approved self-closing fire door.

12-2.2.4 Quantities exceeding 500 ft³ (14.2 m³) of loose combustible fibers shall be permitted to be stored in approved vaults, constructed as follows:

- (1) Storage vaults shall be located outside of buildings or, if located inside, shall be provided with approved safety vents to the outside.
- (2) Walls, floors, and ceilings shall be constructed of approved noncombustible material having a fire resistance rating of not less than 1 hour. Roofs of outside vaults shall be of noncombustible material, but shall be permitted to be constructed so as to readily give way in case of an internal explosion.
- (3) Openings, if any, between vault and main building shall be protected on each side of the wall by an approved fire door. Wall openings in outside vaults exposing other buildings (not sufficiently detached to be considered cut-off) shall be protected by approved fire doors.
- (4) Vaults located within buildings and exceeding 1000 ft³ (28.3 m³) storage capacity shall be protected by an approved, automatic fire-extinguishing system.

12-2.2.5 Not more than 2500 ft³ (71 m³) of loose fibers shall be permitted to be stored in a detached loose house suitably located, with openings properly protected against the entrance of sparks. The loose house shall be used for no other purpose.

12-2.3 Baled Storage.

12-2.3.1 No single block or pile shall contain more than 25,000 ft³ (708 m³) of combustible fibers, exclusive of aisles or clearances. Blocks or piles of baled fiber shall be separated from adjacent storage by aisles not less than 5 ft (1.5 m) wide or by flash fire barriers consisting of continuous sheets of noncombustible material extending from the floor to a height of at least 2 ft (0.6 m) beyond the top of the piles.

12-2.3.2 Sisal and other fibers in bales bound with combustible tie ropes or jute and other fibers that are liable to swell when wet shall be stored in a manner that allows for expansion in any direction without endangering building walls, ceilings, or columns. Not less than 3 ft (0.9 m) of clearance shall be left between walls and sides of piles, except that in storage compartments not more than 30 ft (9 m) in width, 1 ft (0.3 m) clearance at side walls shall be sufficient, provided that a center aisle not less than 5 ft (1.5 m) wide is maintained.

12-2.3.3 Unlimited quantities of hay, straw, and other agricultural products shall be permitted to be stored in or near farm buildings located outside of closely built areas.

12-2.3.4 Combustible fibers shall not be stored in rooms or buildings with hazardous gases, flammable liquids, dangerous chemicals, or other similar materials.

12-2.4 Sources of Ignition.

12-2.4.1 Trucks or automobiles, other than mechanical handling equipment and approved industrial trucks as listed in NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance,*

nance, and Operation, shall not enter any fiber storage room or building but shall be permitted to be used at loading platforms.

12-2.4.2 Electrical wiring and equipment in any combustible fiber storage room or building shall be installed in accordance with the requirements of NFPA 70, *National Electrical Code*, for Class III hazardous locations. The authority having jurisdiction shall be responsible for designating the areas requiring hazardous location electrical classifications and shall classify the area in accordance with the classification system set forth in NFPA 70.

12-2.4.3 No smoking or open flame shall be permitted in any area where combustible fibers are handled or stored, nor within 50 ft (15 m) of any uncovered pile of such fibers. "No Smoking" signs shall be posted.

12-2.5 Portable Extinguishers. Portable fire extinguishers shall be installed as required for extra-hazard occupancy protection as applicable in NFPA 10, *Standard for Portable Fire Extinguishers*.

Chapter 13 Commercial Cooking Equipment

13-1 Commercial Cooking Equipment.

13-1.1 Cooking equipment used in processes producing smoke or grease-laden vapors shall be equipped with an exhaust system that complies with all the equipment and performance requirements of NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, and all such equipment and performance shall be maintained per NFPA 96 during all periods of operation of the cooking equipment. Specifically, the following equipment shall be kept in good working condition:

- (1) Cooking equipment
- (2) Hoods
- (3) Ducts (if applicable)
- (4) Fans
- (5) Fire suppression systems
- (6) Special effluent or energy control equipment

All airflows shall be maintained. Maintenance and repairs shall be performed on all components at intervals necessary to maintain these conditions. (96:1-3.1)

13-1.2 All solid fuel cooking equipment shall comply with the requirements of Chapter 11 of NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*. (96:1-3.1.1)

13-1.3 Cooking equipment used in fixed, mobile, or temporary concessions, such as trucks, buses, trailers, pavilions, tents, or any form of roofed enclosure, shall comply with NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, unless all or part of the installation is exempted by the authority having jurisdiction. (96:1-3.1.4)

13-1.4* Clearance.

13-1.4.1 Except where enclosures are required, hoods, grease removal devices, exhaust fans, and ducts shall have a clearance of at least 18 in. (457.2 mm) to combustible material, 3 in. (76.2 mm) to limited-combustible material, and 0 in. (0 mm) to noncombustible material. [See Figures A-1-3.2(a) through (e) of NFPA 96.]

Exception No. 1: Where the hood duct, or grease removal device is listed for lesser clearances.

Exception No. 2: Clearance to combustible material shall be permitted to be reduced where the combustible material is protected as follows:

(a) 0.013-in. (0.33-mm) (28-gauge) sheet metal spaced out 1 in. (25.4 mm) on noncombustible spacers shall have 9-in. (228.6-mm) clearance to combustible material.

(b) 0.027-in. (0.69-mm) (22-gauge) sheet metal on 1-in. (25.4-mm) mineral wool bats or ceramic fiber blanket reinforced with wire mesh or equivalent spaced out 1 in. (25.4 mm) on noncombustible spacers shall have 3-in. (76.2-mm) clearance to combustible material. See Figures A-1-3.2(f) and (g) of NFPA 96 for examples of clearance reduction systems.

Exception No. 3: Clearance to limited-combustible materials shall be permitted to be reduced to zero clearance where protected by metal lath and plaster, ceramic tile, quarry tile, other noncombustible materials or assembly of non-combustible materials, or materials and products that are listed for the purpose of reducing clearance and are acceptable to the authority having jurisdiction. The listed materials shall be installed in accordance with the conditions of the listing and the manufacturer's instructions and shall be acceptable to the authority having jurisdiction. (96:1-3.2.1)

13-1.4.2 Measures shall be taken to prevent physical damage to any material or product used for the purpose of reducing clearances. In the event of damage, the material or product shall be repaired and restored to meet its intended listing or clearance requirements and shall be acceptable to the authority having jurisdiction. In the event of a fire within a kitchen exhaust system, the duct and its enclosure (rated shaft, factory-built grease duct enclosure, or field applied grease duct enclosure) shall be inspected by qualified personnel to determine whether the duct and protection method are structurally sound, capable of maintaining their fire protection function, and suitable for continued operation. (96:1-3.2.1.1)

13-1.5 Cleaning.

13-1.5.1* Hoods, grease removal devices, fans, ducts, and other appurtenances shall be cleaned to bare metal at frequent intervals prior to surfaces becoming heavily contaminated with grease or oily sludge. After the exhaust system is cleaned to bare metal, it shall not be coated with powder or other substance. The entire exhaust system shall be inspected by properly trained, qualified, and certified company or person(s) acceptable to the authority having jurisdiction in accordance with Table 13-1.5.1. (96:8-3.1)

Table 13-1.5.1 Exhaust System Inspection Schedule

| Type or Volume of Cooking | Frequency |
|--|--------------|
| Systems serving solid fuel cooking operations | Monthly |
| Systems serving high-volume cooking operations such as 24-hour cooking, charbroiling or wok cooking | Quarterly |
| Systems serving moderate-volume cooking operations | Semiannually |
| Systems serving low-volume cooking operations, such as churches, day camps, seasonal businesses, or senior centers | Annually |

(96:Table 8-3.1)

13-1.5.1.1 Upon inspection, if found to be contaminated with deposits from grease-laden vapors, the entire exhaust system shall be cleaned by a properly trained, qualified, and certified company or person(s) acceptable to the authority having jurisdiction in accordance with 13-1.5 through 13-1.5.6. (96:8-3.1.1)

13-1.5.1.2 When a vent cleaning service is used, a certificate showing date of inspection or cleaning shall be maintained on the premises. After cleaning is completed, the vent cleaning contractor shall place or display within the kitchen area a label indicating the date cleaned and the name of the servicing company. The label shall also indicate areas not cleaned. (96:8-3.1.2)

13-1.5.2 Flammable solvents or other flammable cleaning aids shall not be used. (96:8-3.2)

13-1.5.3 At the start of the cleaning process, electrical switches that could be activated accidentally shall be locked out. (96:8-3.3)

13-1.5.4 Components of the fire suppression system shall not be rendered inoperable during the cleaning process.

Exception: Servicing by properly trained and qualified persons in accordance with Section 8-2 of NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations. (96:8-3.4)

13-1.5.5 Care shall be taken not to apply cleaning chemicals on fusible links or other detection devices of the automatic extinguishing system. (96:8-3.5)

13-1.5.6 When cleaning procedures are completed, all electrical switches and system components shall be returned to an operable state. All access panels (doors) and cover plates shall be replaced. Dampers and diffusers shall be positioned for proper airflow. (96:8-3.6)

13-1.6 Deep fat fryers shall be equipped with a separate high-limit control in addition to the adjustable operating control (thermostat) to shut off fuel or energy when the fat temperature reaches 475°F (246°C) at 1 in. (25.4 mm) below the surface. (96:9-2)

13-1.7 Food preparation facilities protected in accordance with Section 13-3 shall not be required to have openings protected between food preparation areas and dining areas. Where domestic cooking equipment is used for food warming or limited cooking, protection or segregation of food preparation facilities shall not be required.

13-2 Portable Fire Extinguishers.

13-2.1* Portable fire extinguishers shall be installed in kitchen cooking areas in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*. Such extinguishers shall use agents that saponify upon contact with hot grease such as sodium bicarbonate and potassium bicarbonate dry chemical and potassium carbonate solutions. Class B gas-type portables such as CO₂ and halon shall not be permitted in kitchen cooking areas. Manufacturer's recommendations shall be followed. (96:7-10.1)

13-2.2 Portable fire extinguishers listed specifically for use in the kitchen cooking areas shall also be permitted. (96:7-10.1.1)

13-2.3* Fire extinguishers provided for the protection of cooking appliances that use combustible cooking media (vegetable or animal oils and fats) shall be listed and labeled for Class K fires.

Exception: Extinguishers installed specifically for these hazards prior to June 30, 1998. (10:2-3.2)

13-2.4 Other fire extinguishers in the kitchen area shall be installed in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*. (96:7-10.2)

13-3 Extinguishing Systems for Commercial Cooking Equipment.

13-3.1 General.

13-3.1.1 The design, installation, protection, and maintenance of exhaust system components including hoods, grease removal devices, exhaust ducts, dampers, air-moving devices, auxiliary equipment, and fire-extinguishing equipment for the exhaust system and the cooking equipment in commercial, industrial, institutional, and similar cooking applications shall be in accordance with this section and NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*.

13-3.1.2 Prior to installation of any extinguishing system, shop drawings shall be reviewed and approved by the authority having jurisdiction. (See Section 1-16 for permits required.)

13-3.2 Where Required.

13-3.2.1 Fire-extinguishing equipment for the protection of grease removal devices, hood exhaust plenums, and exhaust duct systems shall be provided. (96:7-1.1)

13-3.2.2 Cooking equipment that produces grease laden vapors (such as, but not limited to, deep fat fryers, ranges, griddles, broilers, woks, tilting skillets, and braising pans) shall be protected by fire-extinguishing equipment. (96:7-1.2)

13-3.3 Types of Equipment.

13-3.3.1 Fire-extinguishing systems equipment shall include both automatic fire-extinguishing systems as primary protection and portable fire extinguishers as secondary backup. (96:7-2.1)

13-3.3.2 A placard identifying the use of the extinguisher as a secondary backup means to the automatic fire suppression system shall be conspicuously placed near each portable fire extinguisher in the cooking area. (96:7-2.1.1)

13-3.3.3* Automatic fire-extinguishing systems shall comply with standard UL 300, *Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas*, or other equivalent standards and shall be installed in accordance with their listing.

Exception: Automatic fire-extinguishing equipment provided as part of listed recirculating systems complying with standard UL 197, Standard for Safety — Commercial Electric Cooking Appliances. (96:7-2.2)

13-3.3.4 Automatic fire-extinguishing systems shall be installed in accordance with the terms of their listing, the manufacturer's instructions, and the following standards where applicable:

- (1) NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*
- (2) NFPA 13, *Standard for the Installation of Sprinkler Systems*
- (3) NFPA 17, *Standard for Dry Chemical Extinguishing Systems*
- (4) NFPA 17A, *Standard for Wet Chemical Extinguishing Systems* (96:7-2.2.1)

13-3.3.5 Grease removal devices, hood exhaust plenums, and exhaust ducts requiring protection in accordance with 13-3.2.1 shall be permitted to be protected by a listed fixed baffle hood containing a constant or fire-actuated water-wash system that is listed to extinguish a fire in the grease removal devices, hood exhaust plenums, and exhaust ducts. Each such area not provided with a listed water-wash extinguishing system shall be provided with an appropriate fire suppression system listed for the purpose. (96:7-2.3)

13-3.3.5.1 The water for listed fixed baffle hood assemblies shall be permitted to be supplied from the domestic water supply when the minimum water pressure and flow are provided in accordance with the terms of the listing. The water supply shall be monitored by an annunciated low-water pressure switch. (96:7-2.3.1)

13-3.3.5.2 The water wash in the fixed baffle hood shall be activated by the cooking equipment extinguishing system. (96:7-2.3.2)

13-3.4 Simultaneous Operation. Fixed pipe extinguishing systems in a single hazard area (see Section 1-2 of NFPA 96 for the def-

inition of single hazard area) shall be arranged for simultaneous automatic operation upon actuation of any one of the systems.

Exception No. 1: Where the fixed pipe extinguishing system is an automatic sprinkler system.

Exception No. 2: A dry or wet chemical system shall be permitted to be used to protect common exhaust ductwork by one of the methods specified in NFPA 17, Standard for Dry Chemical Extinguishing Systems, or NFPA 17A, Standard for Wet Chemical Extinguishing Systems, in lieu of simultaneous automatic operation. (96:7-3)

13-3.5 Fuel Shutoff.

13-3.5.1 Upon activation of any fire-extinguishing system for a cooking operation, all sources of fuel and electric power that produce heat to all equipment requiring protection by that system shall automatically shut off.

Exception No. 1: Steam supplied from an external source.

Exception No. 2: Solid fuel cooking operations. (96:7-4.1)

13-3.5.2 Any gas appliance not requiring protection, but located under the same ventilating equipment, shall also automatically shut off upon activation of any extinguishing system. (96:7-4.2)

13-3.5.3 Shutoff devices shall require manual reset. (96:7-4.3)

13-3.6 Manual Activation.

13-3.6.1 A readily accessible means for manual activation shall be located between 42 in. and 60 in. (1067 mm and 1524 mm) above the floor, located in a path of exit or egress and clearly identify the hazard protected. The automatic and manual means of system activation external to the control head or releasing device shall be separate and independent of each other so that failure of one will not impair the operation of the other.

Exception No. 1: The manual means of system activation shall be permitted to be common with the automatic means if the manual activation device is located between the control head or releasing device and the first fusible link.

Exception No. 2: An automatic sprinkler system. (96:7-5.1)

13-3.6.2 The means for manual actuator(s) shall be mechanical and shall not rely on electrical power for actuation.

Exception: Electrical power shall be permitted to be used for manual activation if a standby power supply is provided or if supervision is provided as per 13-3.8. (96:7-5.2)

13-3.7 System Annunciation.

13-3.7.1 Upon activation of an automatic fire-extinguishing system, an audible alarm or visual indicator shall be provided to show that the system has activated. (96:7-6.1)

13-3.7.2 Where a fire alarm signaling system is serving the occupancy where the extinguishing system is located, the activation of the automatic fire-extinguishing system shall activate the fire alarm signaling system. (96:7-6.2)

13-3.8 System Supervision. Where electrical power is required to operate the automatic fire-extinguishing system, it shall be monitored by a supervisory alarm, with a standby power supply provided.

Exception No. 1: Where automatic fire-extinguishing systems include automatic mechanical detection and actuation as a backup detection system.

Exception No. 2: Where fire-extinguishing systems are interconnected or interlocked with the cooking equipment power sources so that if the fire-extinguishing system becomes inoperable due to power failure, all sources of fuel or electric power that produce heat to all cooking equipment serviced by that hood shall automatically shut off. (96:7-7.1)

13-3.9 Inspection. An inspection and servicing of the fire extinguishing system and listed exhaust hoods containing a constant or fire-actuated water system shall be made at least every 6 months by properly trained and qualified persons. (96:8-2)

13-3.9.1 All actuation components, including remote manual pull stations, mechanical or electrical devices, detectors, actuators, fire-actuated dampers, etc., shall be checked for proper operation during the inspection in accordance with the manufacturer's listed procedures. In addition to these requirements, the specific inspection requirements of the applicable NFPA standard shall also be followed. (96:8-2.1)

13-3.9.2 Fusible links (including fusible links on fire-actuated damper assemblies) and automatic sprinkler heads shall be replaced at least annually, or more frequently if necessary, to ensure proper operation of the system. Other detection devices shall be serviced or replaced in accordance with the manufacturer's recommendations.

Exception: Where automatic bulb-type sprinklers or spray nozzles are used and annual examination shows no buildup of grease or other material on the sprinkler or spray nozzles. (96:8-2.2)

13-3.9.3 If required, certificates of inspection and maintenance shall be forwarded to the authority having jurisdiction. (96:8-2.3)

Chapter 14 Drycleaning

14-1 General.

14-1.1 Drycleaning plants shall comply with this chapter and NFPA 32, *Standard for Drycleaning Plants*.

14-1.2 Drycleaning plants or systems using solvents that have a flash point below 100°F (37.8°C) shall be prohibited.

14-2 Permits. Permits, where required, shall comply with Section 1-16.

Chapter 15 Dust Explosion Prevention

15-1 General. Equipment, processes, and operations that involve the manufacture, processing, blending, repackaging, or handling of combustible particulate solids or combustible dusts regardless of concentration or particle size shall be installed and maintained in accordance with the following standards as applicable:

NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Products Facilities*

NFPA 69, *Standard on Explosion Prevention Systems*

NFPA 120, *Standard for Coal Preparation Plants*

NFPA 480, *Standard for the Storage, Handling, and Processing of Magnesium Solids and Powders*

NFPA 481, *Standard for the Production, Processing, Handling, and Storage of Titanium*

NFPA 482, *Standard for the Production, Processing, Handling, and Storage of Zirconium*

NFPA 485, *Standard for the Storage, Handling, Processing, and Use of Lithium Metal*

NFPA 650, *Standard for Pneumatic Conveying Systems for Handling Combustible Particulate Solids*

NFPA 651, *Standard for the Machining and Finishing of Aluminum and the Production and Handling of Aluminum Powders*

NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids*

NFPA 655, *Standard for Prevention of Sulfur Fires and Explosions*

NFPA 664, *Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities*

NFPA 8503, *Standard for Pulverized Fuel Systems*

15-2 Permits. Permits, where required, shall comply with Section 1-16.

Chapter 16 Fireworks, Model Rocketry, and Explosives

16-1 Fireworks Displays. The construction, handling, and use of fireworks intended solely for outdoor display as well as the general conduct and operation of the display shall comply with the requirements of NFPA 1123, *Code for Fireworks Display*.

16-2 Pyrotechnics Before a Proximate Audience. The use of pyrotechnic special effects in the performing arts in conjunction with theatrical, musical, or any similar productions before a proximate audience, performers, or support personnel shall comply with NFPA 1126, *Standard for the Use of Pyrotechnics before a Proximate Audience*. Any indoor display of pyrotechnic special effects; any outdoor use of pyrotechnic special effects at distances less than those required by NFPA 1123, *Code for Fireworks Display*, the use of pyrotechnic special effects during any videotaping, audiotaping, or filming of any television, radio, or movie production if such production is before a proximate audience; or the rehearsal of any production in which pyrotechnic special effects are used shall also comply with NFPA 1126.

16-3 Flame Effects Before an Audience. The use of flame effects before an audience shall comply with NFPA 160, *Standard for Flame Effects Before an Audience*.

16-4 Fireworks Manufacturing. The manufacture, transportation, or storage of fireworks shall comply with NFPA 1124, *Code for the Manufacture, Transportation, and Storage of Fireworks and Pyrotechnic Articles*.

16-5 Model Rocketry. The design, construction, limitations of propellant mass and power, and reliability of model rocket motors and model rocket motor reloading kits and their components produced commercially for sale to or use by the public for purposes of education, recreation, and sporting competition, shall comply with NFPA 1122, *Code for Model Rocketry*.

16-6 Rocketry Manufacturing. The manufacture of model rocket motors designed, sold, and used for the purpose of propelling recoverable aero models shall comply with NFPA 1125, *Code for the Manufacture of Model Rocket and High Power Rocket Motors*.

16-7 High Power Rocketry. The design, construction, limitations of propellant mass and power, and reliability of all high-power rocket motors and motor components produced commercially for sale to or use by the certified user for education, recreation, and sporting competition shall comply with NFPA 1127, *Code for High Power Rocketry*.

16-8 Explosives. The manufacture, transportation, storage, sale, and use of explosive materials shall comply with NFPA 495, *Explosive Materials Code*, and NFPA 498, *Standard for Safe Havens and Interchange Lots for Vehicles Transporting Explosives*.

16-9 Ammonium Nitrate. The storage of ammonium nitrate in the form of crystals, flakes, grains, or prills including fertilizer grade, dynamite grade, nitrous oxide grade, technical grade, and other mixtures containing 60 percent or more by weight of ammonium nitrate shall comply with NFPA 490, *Code for the Storage of Ammonium Nitrate*.

16-10 Sale, Handling, and Storage of Consumer Fireworks.

16-10.1 Application. Where permitted, the storage and sale, retail or wholesale, of consumer fireworks (DOT Classified) shall be in accordance with this section to ensure public safety.

All storage of display fireworks shall comply with NFPA 1124, *Code for the Manufacture, Transportation, and Storage of Fireworks and Pyrotechnic Articles*.

16-10.2 Permits. Permits, where required, shall comply with Section 1-16.

16-10.3 Reserved.

16-10.4 Reserved.

16-10.5 Fire Protection.

16-10.5.1 Reserved.

16-10.5.2 Portable fire extinguishers shall be installed as required for extra-hazard occupancy protection as applicable in NFPA 10, *Standard for Portable Fire Extinguishers*.

16-10.6 Reserved.

16-10.7 Storage Area. All storage of fireworks shall be secured to prevent unauthorized access by the public. All storage of consumer fireworks shall not be located in direct sunlight. Loose or piled combustible material and weeds and long grass shall not be permitted within 25 ft (7.6 m) of the storage facility.

16-10.7.1 Means of egress in all buildings shall comply with the applicable requirements of NFPA 101, *Life Safety Code*.

Exception: Trailers, semitrailers or metal shipping containers that are not normally occupied. (1124:4-2.2.1)

16-10.7.2 All doors shall open outward, and all exits shall be marked clearly. Aisles and exit doors shall be kept free of obstructions. (1124:4-2.3)

16-10.7.3 Doors shall be equipped with panic hardware. Doors shall be unlocked during operations.

Exception: Trailers, semitrailers or metal shipping containers that are not normally occupied. (1124:4-2.3.1)

16-10.7.4 Buildings used for the storage of consumer fireworks shall be non-residential, shall not exceed one-story, and shall be without basements. (1124:4-2.4)

16-10.7.5 Consumer fireworks stored in a building that is also used for other purposes shall be stored in a room or area used exclusively for the storage of consumer fireworks. Interior walls of such room shall have a minimum fire-resistance rating of 1-hour with doors having a 45-minute fire-resistance rating.

Exception: When acceptable to the authority having jurisdiction, non-combustible materials shall be permitted to be stored in the same room or area with consumer fireworks. (1124:4-2.4.1)

16-10.8 Sources of Ignition.

16-10.8.1 Smoking or open flame shall be prohibited at all times within 50 ft (15.2 m) of the facility. "No Smoking" signs shall be posted.

16-10.8.2 All electrical wiring shall be in accordance with NFPA 70, *National Electrical Code*.

16-10.8.3 Electrical receptacles or unguarded light fixtures shall not be permitted within 25 ft (7.6 m) of any fireworks. Light fixtures within 25 ft (7.6 m) of any fireworks shall have guards. (1124:4-3.2)

16-10.8.4 No extension cords or other temporary wiring shall be permitted within 25 ft (7.6 m) of any stored consumer fireworks. (1124:4-3.5)

Chapter 17 Flammable and Combustible Liquids

17-1 General. This chapter shall apply to the storage, handling, and use of flammable and combustible liquids, including spray applications, dipping and coating operations, and solvent extraction.

17-2* Storage, Handling and Use. The storage, handling, and use of flammable and combustible liquids, including waste liquids, shall comply with this section and NFPA 30, *Flammable and Combustible Liquids Code*.

17-2.1 Section 17-2 shall not apply to the following:

- (1) Any liquid that has a melting point equal to or greater than 100°F (37.8°C) or that does not meet the criteria for fluidity given in the definition for *Liquid* in Section 1-6 of NFPA 30, *Flammable and Combustible Liquids Code*
- (2) Any liquefied gas or cryogenic liquid as defined in Section 1-6 of NFPA 30
- (3) Any liquid that does not have a flash point, which can be flammable under some conditions, such as certain halogenated hydrocarbons and mixtures containing halogenated hydrocarbons
- (4) Any aerosol product
- (5) Any mist, spray, or foam
- (6) Storage of flammable and combustible liquids as covered by NFPA 395, *Standard for the Storage of Flammable and Combustible Liquids at Farms and Isolated Sites*

17-2.2 Section 17-2 shall also not apply to the following:

- (1) Transportation of flammable and combustible liquids as governed by the U.S. Department of Transportation
- (2) Storage, handling, and use of fuel oil tanks and containers connected with oil-burning equipment

17-2.3 Permit Required. Permits, where required, shall comply with Section 1-16.

17-3 Spray Application Using Flammable or Combustible Materials.

17-3.1 Application.

17-3.1.1* Operations involving the spray application of flammable and combustible materials shall comply with Section 17-3 and NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*.

17-3.1.2 Section 17-3 shall apply to the spray application of flammable liquids, combustible liquids or combustible powders either continuously or intermittently, by any of the following methods:

- (1) Compressed air atomization
- (2) Airless or hydraulic atomization
- (3) Electrostatic application methods
- (4) Fluidized bed application methods
- (5) Electrostatic fluidized bed application methods
- (6) Other acceptable application means

17-3.1.3 Section 17-3 shall not apply to the following:

- (1) Spray application processes or operations that are conducted outdoors
- (2) Small portable spraying equipment or aerosol products that are not used repeatedly in the same location
- (3) Spray application of noncombustible materials.

Exception: Where certain waterborne, spray-applied materials that contain flammable or combustible liquids or that produce combustible

residues or deposits are used, the applicable provisions of this section shall apply.

17-3.1.4 Permits, where required, shall comply with Section 1-16.

17-3.2 Location of Spray Application Operations.

17-3.2.1 Spray application operations and processes shall be confined to spray booths, spray rooms, or spray areas, as defined in this Code. (33:2-1)

17-3.2.2 Spray application operations and processes shall not be conducted in any building that is classified as an assembly, educational, institutional, or residential occupancy, unless they are located in a room that is separated both vertically and horizontally from all surrounding areas by construction having a fire resistance rating of not less than 2 hours and that is protected by an approved automatic sprinkler system designed and installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*. (33:2-2)

17-3.3 Spray Area.

17-3.3.1 Walls and ceilings that intersect or enclose a spray area shall be constructed of noncombustible or limited-combustible materials or assemblies and shall be securely and rigidly mounted or fastened. The interior surfaces of the spray area shall be smooth, designed and installed to prevent pockets that can trap residues, and designed to facilitate ventilation and cleaning. Air intake filters that are a part of a wall or ceiling assembly shall be listed as Class 1 or Class 2, in accordance with UL 900, *Test Performance of Air Filter Units*. The floor of the spray area shall be constructed of noncombustible material, limited-combustible material, or combustible material that is completely covered by noncombustible material. Aluminum shall not be used. (33:3-1)

17-3.3.1.1 If walls or ceiling assemblies are constructed of sheet metal, single-skin assemblies shall be no thinner than 0.0478 in. (1.2 mm) and each sheet of double-skin assemblies shall be no thinner than 0.0359 in. (0.9 mm). (33:3-1.1)

17-3.3.1.2 Structural sections of spray booths shall be permitted to be sealed with latex-based or similar caulks and sealants to minimize air leakage. (33:3-1.2)

17-3.3.1.3 Spray rooms shall be constructed of and separated from surrounding areas of the building by construction assemblies that have a fire resistance rating of 1 hour. (33:3-1.3)

17-3.3.1.4 Enclosed spray booths and spray rooms shall be provided with means of egress that meet the requirements of NFPA 101, *Life Safety Code*. (33:3-1.4)

17-3.3.1.5 Spray booths that are used exclusively for powder coating shall meet the requirements of Chapter 13 of NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*. They shall be permitted to be constructed of suitable fire retardant combustible materials where approved by the authority having jurisdiction.

Exception: Listed spray booth assemblies that are constructed of other materials shall be permitted. (33:3-1.5)

17-3.3.2 Spray booths shall be separated from other operations by a minimum distance of 3 ft (915 mm) or by a partition, wall, or floor/ceiling assembly having a minimum fire resistance rating of 1 hour. Multiple connected spray booths shall not be considered as "other operations."

Exception: As provided for in Section 11-3 of NFPA 33, Standard for Spray Application Using Flammable or Combustible Materials. (33:3-3)

17-3.3.2.1 Spray booths shall be installed so that all parts of the booth are readily accessible for cleaning. (33:3-3.1)

17-3.3.2.2 A clear space of not less than 3 ft (915 mm) shall be maintained on all sides of the spray booth. This clear space shall be kept free of any storage or combustible construction.

Exception No. 1: This requirement shall not prohibit locating a spray booth closer than 3 ft (915 mm) to or directly against an interior partition, wall, or floor/ceiling assembly that has a fire resistance rating of not less than 1 hour, provided the spray booth can be adequately maintained and cleaned.

Exception No. 2: This requirement shall not prohibit locating a spray booth closer than 3 ft (915 mm) to an exterior wall or a roof assembly provided the wall or roof is constructed of non-combustible material and provided the spray booth can be adequately maintained and cleaned. (33:3-3.2)

17-3.3.3 Panels for light fixtures or for observation shall be of heat-treated glass, wired glass, or hammered-wired glass and shall be sealed to confine vapors, mists, residues, dusts, and deposits to the spray area. Panels for light fixtures shall be separated from the fixture to prevent the surface temperature of the panel from exceeding 200°F (93°C). (33:3-5)

17-3.3.4 Spray areas that are equipped with ventilation distribution or baffle plates or with dry overspray collection filters shall meet the requirements of 17-3.3.4.1 through 17-3.3.4.5. (33:3-6)

17-3.3.4.1 Distribution plates or baffles shall be constructed of noncombustible materials and shall be readily removable or accessible for cleaning on both sides. (33:3-6.1)

17-3.3.4.2 Filters shall not be used when applying materials known to be highly susceptible to spontaneous heating or spontaneous ignition. (33:3-6.2)

17-3.3.4.3 Supports and holders for filters shall be constructed of noncombustible materials. (33:3-6.3)

17-3.3.4.4 Overspray collection filters shall be readily removable or accessible for cleaning or replacement. (33:3-6.4)

17-3.3.4.5 Filters shall not be alternately used for different types of coating materials if the combination of the materials might result in spontaneous heating or ignition. (See also Section 8-8 of NFPA 33, Standard for Spray Application Using Flammable or Combustible Materials.) (33:3-6.5)

17-3.4 Electrical and Other Sources of Ignition.

17-3.4.1 General. Electrical wiring and utilization equipment shall meet all the applicable requirements of Articles 500, 501, 502, and 516 of NFPA 70, *National Electrical Code*, and 17-3.4.1 through 17-3.4.7.

Exception No. 1: Powered vehicles shall meet the requirements of Section 3-4 of NFPA 33, Standard for Spray Application Using Flammable or Combustible Materials.

Exception No. 2: Resin application operations shall meet the requirements of Chapter 15 of NFPA 33, Standard for Spray Application Using Flammable or Combustible Materials. (33:4-1)

17-3.4.1.1 Electrostatic spray application apparatus also shall meet the requirements of Chapter 9 or Chapter 10 of NFPA 33, whichever is applicable. (33:4-1.1)

17-3.4.1.2 Drying, curing, and fusing apparatus also shall meet the requirements of Chapter 11 of NFPA 33. (33:4-1.2)

17-3.4.1.3 Automobile undercoating operations also shall meet the requirements of Chapter 12 of NFPA 33. (33:4-1.3)

17-3.4.1.4 Powder coating apparatus also shall meet the requirements of Chapter 13 of NFPA 33. (33:4-1.4)

17-3.4.1.5 Open flames, spark-producing equipment or processes, and equipment whose exposed surfaces exceed the autoignition temperature of the material being sprayed shall not be located in the spray area or in surrounding areas classified as Division 2.

Exception: This requirement shall not apply to drying, curing, or fusing apparatus as covered by Chapter 11 of NFPA 33. (33:4-1.5)

17-3.4.1.6 Any utilization equipment or apparatus that is capable of producing sparks or particles of hot metal and is located above or adjacent to either the spray area or the surrounding Division 2 areas shall be of the totally enclosed type or shall be constructed to prevent the escape of sparks or particles of hot metal. (33:4-1.6)

17-3.4.2 Electrical Devices in Spray Areas.

17-3.4.2.1 Electrical wiring and utilization equipment that is located in the spray area and is not subject to deposits of combustible residues shall be suitable for Class I, Division 1 or Class II, Division 1 locations, whichever is applicable. (See NFPA 70, *National Electrical Code*.) (33:4-2.1)

17-3.4.2.2 Electrical wiring and utilization equipment that is located in the spray area and is subject to deposits of combustible residues shall be listed for such exposure and shall be suitable for Class I, Division 1 or Class II, Division 1 locations, whichever is applicable. (See NFPA 70, *National Electrical Code*.) (33:4-2.2)

17-3.4.3 Electrical Devices Adjacent to Spray Areas. Electrical wiring and utilization equipment located adjacent to the spray area shall be classified in accordance with 17-3.4.3.1 through 17-3.4.3.5. (33:4-3)

17-3.4.3.1 Electrical wiring and utilization equipment located outside, but within 20 ft (6100 mm) horizontally and 10 ft (3050 mm) vertically, of an unenclosed spray area and not separated from the spray area by partitions extending to the boundaries of the area designated as Division 2 in Figure 17-3.4.3.1 shall be suitable for Class I, Division 2 or Class II, Division 2 locations, whichever is applicable. (33:4-3.1)

17-3.4.3.2 If spray application operations are conducted within a closed-top, open-face or open-front booth or room, any electrical wiring or utilization equipment located outside of the booth or room but within the boundaries designated as Division 2 in Figures 17-3.4.3.2(a) and 17-3.4.3.2(b), shall be suitable for Class I, Division 2 or Class II, Division 2 locations, whichever is applicable.

The diagrams illustrate the required protection for Class I, Division 2 or Class II, Division 2 areas. The top diagram, labeled "Top (plan)", shows a large circular area with diagonal hatching, representing the Class I, Division 2 or Class II, Division 2 area. A smaller, solid gray circle within it is labeled "Spray area". A dimension line indicates a radius of 20 ft (6100 mm) from the center of the spray area to the outer edge of the hatched area. The bottom diagram, labeled "Front (elevation)", shows a cross-section of the roof structure. The roof surface is hatched. A solid gray semi-circular area at the base of the roof is labeled "Spray area". A dimension line indicates a height of 10 ft (3050 mm) from the base of the spray area to the top edge of the roof structure. A legend at the bottom identifies the hatching patterns: solid gray for Class I, Division 1 or Class II, Division 1, and diagonal hatching for Class I, Division 2 or Class II, Division 2.

Top (plan)

Roof

Front (elevation)

Class I, Division 1 or Class II, Division 1

Class I, Division 2 or Class II, Division 2

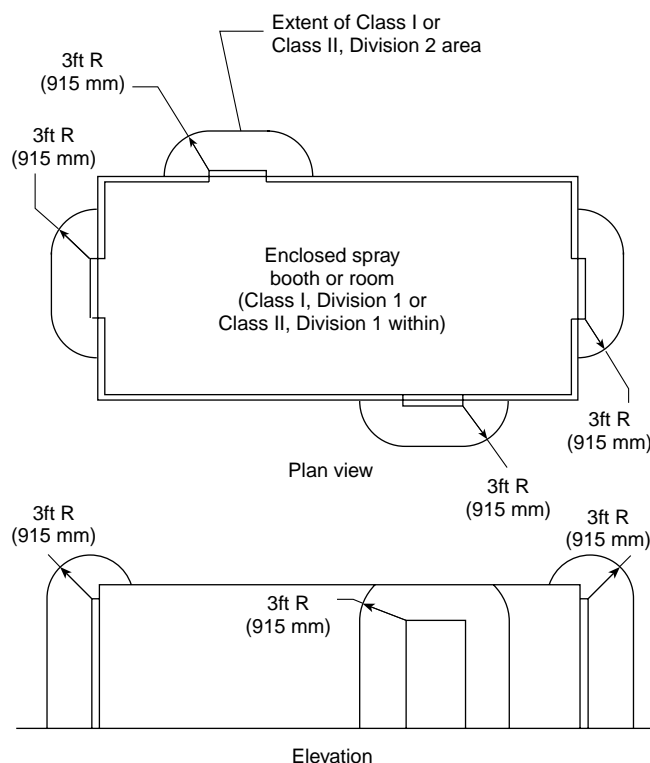
- (1) If the exhaust ventilation system is interlocked with the spray application equipment, then the Division 2 location shall extend 5 ft (1525 mm) horizontally and 3 ft (915 mm) vertically from the open face or open front of the booth or room, as shown in Figure 17-3.4.3.2(a).
- (2) If the exhaust ventilation system is *not* interlocked with the spray application equipment, then the Division 2 location shall extend 10 ft (3050 mm) horizontally and 3 ft (915 mm) vertically from the open face or open front of the booth or room, as shown in Figure 17-3.4.3.2(b).

For the purposes of this subsection, “interlocked” shall mean that the spray application equipment cannot be operated unless the exhaust ventilation system is operating and functioning properly and spray application is automatically stopped if the exhaust ventilation system fails. (33:4-3.2)

17-3.4.3.3 If spray application operations are conducted within an open-top booth, any electrical wiring or utilization equipment located within the space 3 ft (915 mm) vertically of the top of the booth shall be suitable for Class I, Division 2 or Class II, Division 2 locations, whichever is applicable. In addition, any electrical wiring or utilization equipment located within 3 ft (915 mm) in all directions of openings other than the open top also shall be suitable for Class I, Division 2 or Class II, Division 2 locations, whichever is applicable. (33:4-3.3)

17-3.4.3.4 If spray application operations are confined to an enclosed spray booth or room, any electrical wiring or utilization equipment located within 3 ft (915 mm) of any opening shall be suitable for Class I, Division 2 or Class II, Division 2 locations, whichever is applicable. (See Figure 17-3.4.3.4.) **(33:4-3.4)**

FIGURE 17-3.4.3.4 Class I (or Class II), Division 2 locations adjacent to an enclosed spray booth or spray room. (33:Figure 4-3.4)



17-3.4.3.5 Where spray application equipment and supply containers are located in an adequately ventilated area that is adjacent to the spray area, but outside of the storage room or mixing room, the area within 3 ft (915 mm) in all directions from any open container or equipment and extending to the floor or grade level shall be classified as Class I, Division 1 or Class II, Division 1, whichever is applicable. The area extending 2 ft (610 mm) beyond the Division 1 location shall be classified as Class I, Division 2 or Class II, Division 2, whichever is applicable. In addition, the area within 10 ft (3050 mm) horizontally of the perimeter of such open container or equipment, up to a height of 18 in. (458 mm) above the floor or grade level shall be classified as Class I, Division 2 or Class II, Division 2, whichever is applicable. Electrical wiring and utilization equipment installed in these areas shall be suitable for the location. (See Figure 17-3.4.3.5 for an example.) (33:4-3.5)

17-3.4.4 Light Fixtures.

17-3.4.4.1 Light fixtures that are attached to the walls or ceilings of a spray area, but are outside of any classified area and are separated from the spray area by glass panels that meet the requirements of 17-3.3.3 shall be suitable for use in ordinary hazard (general purpose) locations. (See Figure 17-3.4.4.1.) Such fixtures shall be serviced from outside the spray area. (33:4-4.1)

17-3.4.4.2 Light fixtures that are attached to the walls or ceilings of a spray area; are located within the Class I, Division 2 or Class II, Division 2 location; and are separated from the spray area by glass panels that meet the requirements of 17-3.3.3 shall be suitable for use in that location. Such fixtures shall be serviced from outside the spray area. (See Figure 17-3.4.4.1.) (33:4-4.2)

FIGURE 17-3.4.3.5 Electrical area classification around an open container. (33:Figure 4-3.5)

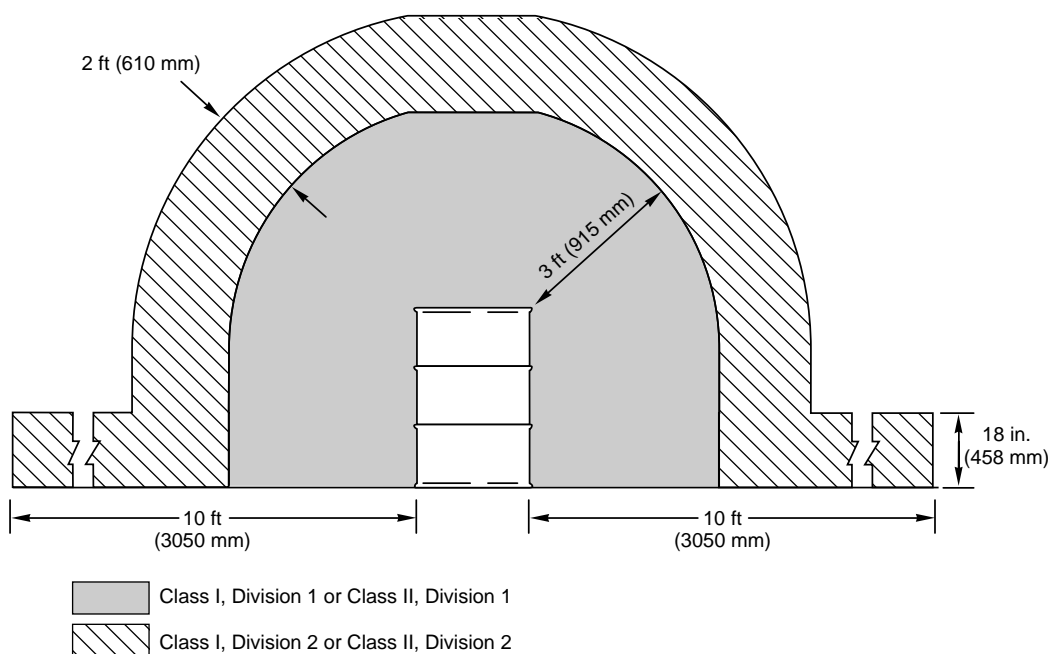
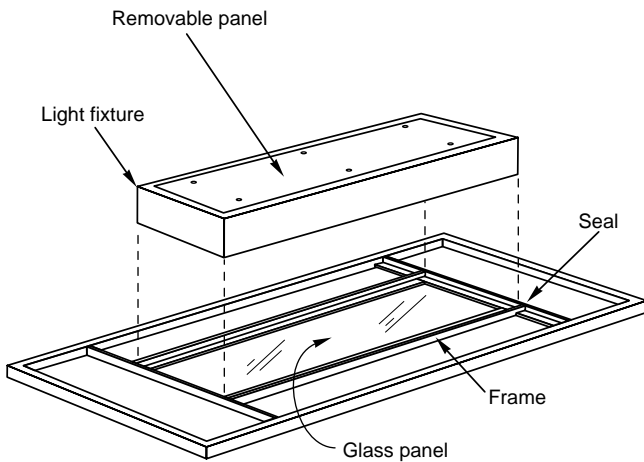


FIGURE 17-3.4.4.1 Example of a light fixture mounted outside of the spray area and serviced from outside the spray area. (33:Figure 4-4.1)



17-3.4.4.3 Light fixtures that are an integral part of the walls or ceiling of a spray area shall be permitted to be separated from the spray area by glass panels that are an integral part of the fixture. Such fixtures shall be listed for use in Class I, Division 2 or Class II, Division 2 locations, whichever is applicable, and also shall be suitable for accumulations of deposits of combustible residues. Such fixtures shall be permitted to be serviced from inside the spray area. (See Figure 17-3.4.4.3.) (33:4-4.3)

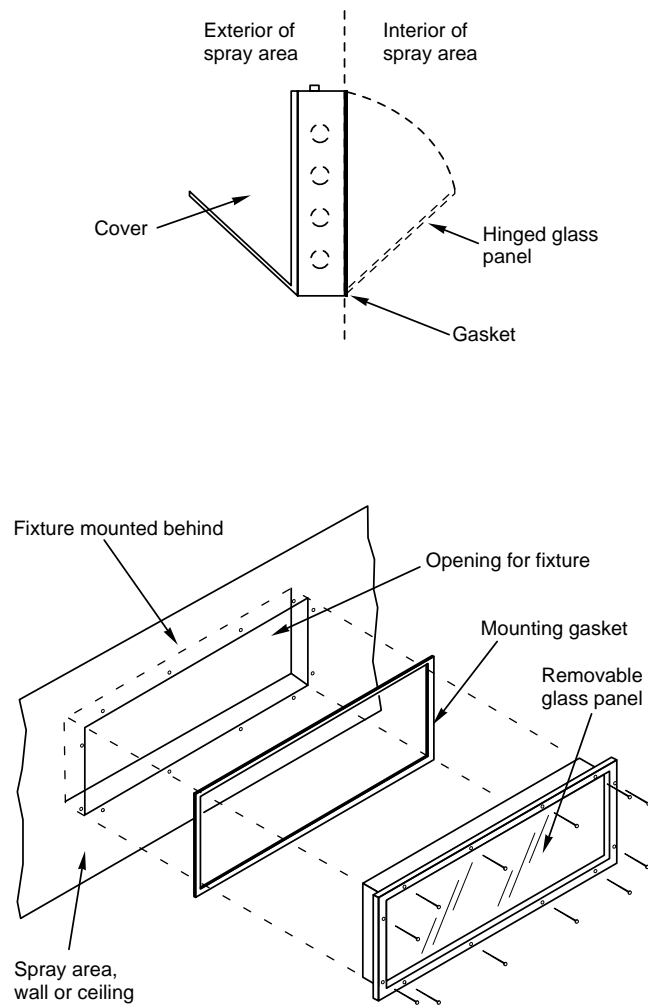
17-3.4.4.4 Light fixtures that are located inside the spray area shall meet the requirements of 17-3.4.2 and 17-3.4.5. (33:4-4.4)

17-3.4.5* Static Electricity. In order to prevent sparks from the accumulation of static electricity, all persons, all electrically-conductive parts of the spray room or spray booth, the exhaust ducts, spray equipment, objects or containers that receive the spray stream, and piping systems that convey flammable or combustible liquids or aerated combustible solids shall be electrically bonded and grounded. (33:4-5)

17-3.4.6 Flexible Power Cords. For automated equipment and robotic equipment, flexible power cords shall be permitted to be used in hazardous (classified) locations and shall be permitted to be connected to the fixed part of the electrical circuit, provided they meet all of the following conditions:

- (1) They are approved for extra-hard usage.
- (2) They are equipped with a grounding conductor that meets the requirements of Section 400-2 of NFPA 70, *National Electrical Code*.
- (3) They are connected to terminals or conductors in an approved manner.
- (4) They are supported by a positive mechanical clamp in such a manner that permits the cord to be readily replaced and prevents strain at the cord connections within the terminal enclosure.
- (5) They are provided with explosionproof seals where the cord enters junction boxes, fittings, or enclosures.
- (6) They are listed for deposits of combustible residues. (33:4-6)

FIGURE 17-3.4.4.3 Examples of light fixtures that are an integral part of the spray area and are serviced from inside the spray area. (33:Figure 4-4.3)



17-3.4.7 Portable Electric Lights. Portable electric light fixtures shall not be used in any spray area while spray application operations are being conducted.

Exception: Where portable electric light fixtures are required for use in spaces that are not readily illuminated by fixed light fixtures within the spray area, they shall meet the requirements of 17-3.4.2.2. (33:4-7)

17-3.5 Ventilation.

17-3.5.1 Ventilating and exhaust systems shall be designed and installed in accordance with the applicable requirements of NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids*, except as amended by the requirements of Chapter 5 of NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*. (33:5-1)

17-3.5.2 Each spray area shall be provided with mechanical ventilation that is capable of confining and removing vapors and mists to a safe location and is capable of confining and controlling combustible residues, dusts, and deposits. The concentration of the vapors and mists in the exhaust stream of the ventilation system shall not exceed 25 percent of the lower flammable limit.

Exception: In confined spaces, where ventilation might not be capable of providing the necessary ventilation, a properly applied inerting procedure shall be permitted to be used. Such procedures shall meet the applicable requirements of NFPA 69, Standard on Explosion Prevention Systems, and shall be acceptable to the authority having jurisdiction. (33:5-2)

17-3.5.2.1 Spray areas equipped with overspray collection filters shall have visible gauges, audible alarms, or an effective inspection program to ensure that the required air velocity is being maintained. (33:5-2.1)

17-3.5.2.2 Powder coating systems also shall meet the requirements of Section 13-6 of NFPA 33. (33:5-2.2)

17-3.5.2.3 Mechanical ventilation shall be kept in operation at all times while spray operations are being conducted and for a sufficient time thereafter to allow the vapors from drying coated objects or material and residues to be exhausted. Where spray operations are conducted automatically without an attendant constantly on duty, the operating controls of the spray apparatus shall be arranged so that the spray apparatus cannot function unless the exhaust fans are operating. (33:5-2.3)

17-3.5.3 Individual spray booths shall be separately ducted to the building exterior.

Exception No. 1: Multiple cabinet spray booths whose combined frontal area does not exceed 18 ft² (1.7 m²) shall be permitted to be manifolded, if the sprayed materials used are not likely to react and cause ignition of the residue in the ducts.

Exception No. 2: Where treatment of exhaust is necessary for air pollution control or for energy conservation, ducts shall be permitted to be manifolded if all of the following conditions are met:

(a) The sprayed materials used shall be unlikely to react and cause ignition of the residue in the ducts.

(b) No nitrocellulose-based finishing material shall be used.

(c) An air-cleaning system shall be provided to reduce the amount of overspray carried into the duct manifold. (A booth filter system shall be considered adequate.)

(d) Automatic sprinkler protection shall be provided at the junction of each booth exhaust with the manifold, in addition to the protection required by Chapter 7 of NFPA 33.

(e) The installation shall be approved by the authority having jurisdiction. (33:5-6)

17-3.5.4 Air exhausted from spray operations shall be conducted by ducts directly to the outside of the building. Exhaust ducts shall follow the most direct route to the point of discharge, but shall not penetrate a fire wall. The exhaust discharge shall be directed away from any fresh air intakes. The exhaust duct discharge point shall be at least 6 ft (1830 mm) from any exterior wall or roof. The exhaust duct shall not discharge in the direction of any combustible construction that is within 25 ft (7625 mm) of the exhaust duct discharge point nor shall it discharge in the direction of any unprotected opening in any noncombustible or limited-combustible construction that is within 25 ft (7625 mm) of the exhaust duct discharge point. (33:5-4)

17-3.5.5 Exhaust ducts shall be permitted to be round, rectangular, or any other suitable shape. They shall be provided with doors, panels, or other means to facilitate inspection, maintenance, cleaning, and access to fire protection devices. (33:5-9)

17-3.5.6 Belts shall not enter any spray area unless the belt and pulley within the spray area is completely enclosed. (33:5-10.3)

17-3.6 Flammable and Combustible Liquids Storage, Handling, and Distribution.

17-3.6.1 General. Storage, handling, and mixing of flammable and combustible liquids shall meet all the applicable requirements of NFPA 30, *Flammable and Combustible Liquids Code*. Storage, handling, and mixing of flammable and combustible liquids at process areas shall also meet the requirements of 17-3.6. (33:6-1)

17-3.6.2 Storage.

17-3.6.2.1 There shall be not more than three approved flammable liquid storage cabinets in any single process area without the approval of the authority having jurisdiction. Storage cabinets shall be listed or shall be designed and constructed to meet the requirements of NFPA 30, *Flammable and Combustible Liquids Code*. Any single cabinet shall contain not more than 120 gal (454 L) of Class I, Class II, or Class IIIA liquids, of which not more than 60 gal (227 L) shall be Class I and Class II liquids. (33:6-2.1)

17-3.6.2.2 The quantity of liquid located in the vicinity of spraying operations, but outside of a storage cabinet, an inside storage room, a cut-off room or attached building, or other specific process area that is cut off by at least a 2-hour fire-rated separation from the spraying operations, shall not exceed the quantity given in either (1) or (2), whichever is greater:

- (1) A supply for one day
- (2) A total of not over
 - a. 25 gal (95 L) of Class IA liquids in containers, plus
 - b. 120 gal (454 L) of Class IB, IC, II, or III liquids in containers, plus
 - c. Two portable tanks each not exceeding 660 gal (2498 L) of Class IB, IC, Class II, or Class IIIA liquids, plus
 - d. Twenty portable tanks each not exceeding 660 gal (2498 L) of Class IIIB liquids. (33:6-2.2)

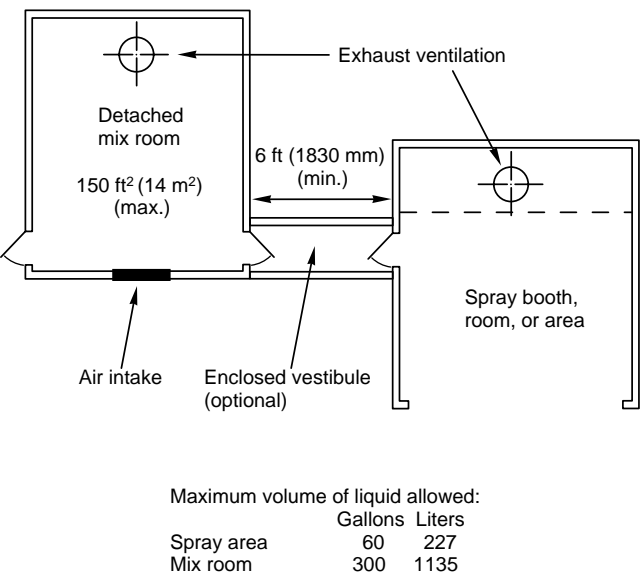
17-3.6.2.3 The quantity of flammable and combustible liquids located in a spray area or in a mixing room adjacent to a spray area shall meet the requirements of 17-3.6.3. (33:6-2.3)

17-3.6.3 Mixing.

17-3.6.3.1 The withdrawal of flammable or combustible liquids from containers and the filling of containers, including portable mixing tanks, shall be done only in a mixing room or in a spray area. The amount of liquid that shall be permitted to be mixed or located in a spray area shall not exceed 60 gal (227 L). The ventilation system shall be in operation and precautions shall be taken to protect against spills of liquid and sources of ignition. (See maximum volume of liquid allowed in Figure 17-3.6.3.2.) (33:6-3.1)

17-3.6.3.2 Mixing rooms shall be permitted to be located adjacent to the spray area, provided quantities of liquid are less than 2 gal/ft² (81.5 L/m²), the floor area is less than 150 ft² (14 m²), and the installation meets the requirements of 17-3.6.3.2.1 through 17-3.6.3.2.6. (See Figure 17-3.6.3.2 for an example of this arrangement.) (33:6-3.2)

FIGURE 17-3.6.3.2 Spray area (booth, room, or open area) with adjacent detached mixing room, including maximum volume of liquid allowed. (33:Figure 6-3.2)



17-3.6.3.2.1 Where the combined quantities of liquids located in a spray area and in the mixing room do not exceed 60 gal (227 L), then the mixing room shall be permitted to be located less than 6 ft (1830 mm) from the spray area or shall be permitted to be an integral part of the spray booth or spray room. [See Figures 17-3.6.3.2.1(a), 17-3.6.3.2.1(b) and 17-3.6.3.2.1(c) for examples.] (33:6-3.2.1)

17-3.6.3.2.2 Construction shall meet the requirements of 17-3.3.1, 17-3.3.1.1, and 17-3.3.1.2. (33:6-3.2.2)

17-3.6.3.2.3 The room shall be designed to contain a liquid spill. (33:6-3.2.3)

17-3.6.3.2.4 The room shall be provided with continuous mechanical ventilation with a capacity of not less than 1 cfm/ft² (0.3 m³/m²) with a minimum rate of 150 cfm (4 m³/min). (33:6-3.2.4)

FIGURE 17-3.6.3.2.1(a) Spray booth or spray room with adjacent three-sided mixing room, with or without vestibule. [33:Figure 6-3.2.1(a)]

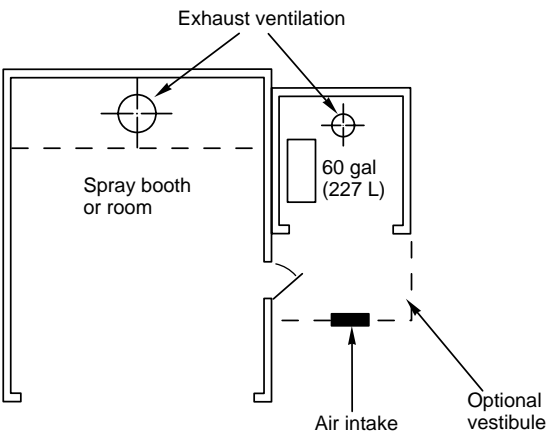


FIGURE 17-3.6.3.2.1(b) Spray booth or spray room with integral mixing room. [33:Figure 6-3.2.1(b)]

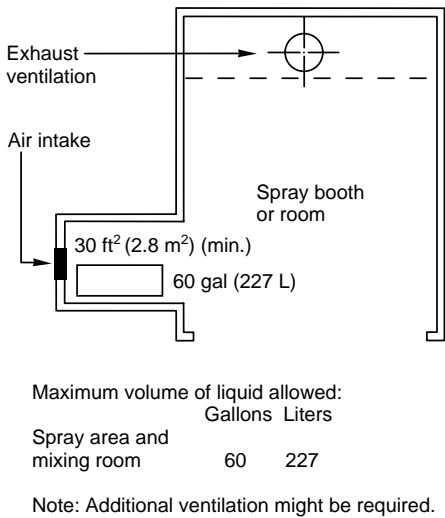
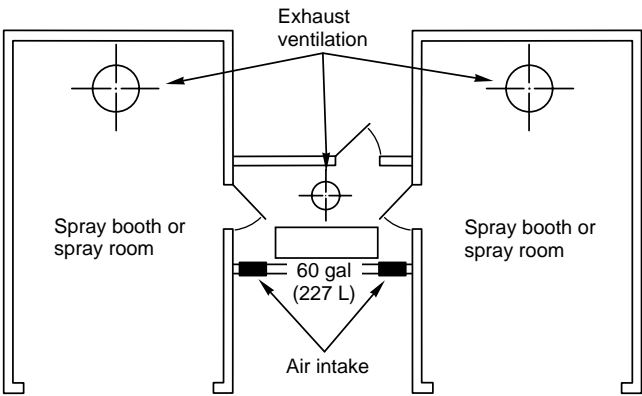


FIGURE 17-3.6.3.2.1(c) Spray booth or spray room connected by enclosed mixing room. [33:Figure 6-3.2.1(c)]



Maximum volume of liquid allowed: 60 gal (227 L)

17-3.6.3.2.5 An approved automatic fire extinguishing system that meets the requirements of Chapter 7 of NFPA 33 shall be provided. (33:6-3.2.5)

17-3.6.3.2.6 An adequate number of suitable fire extinguishers shall be provided and shall be located immediately adjacent to the mixing room. (See NFPA 10, *Standard for Portable Fire Extinguishers*.) (33:6-3.2.6)

17-3.6.4 Distribution Systems — General.

17-3.6.4.1 Closed containers, approved portable tanks, approved safety cans, or a properly arranged system of piping shall be used for transporting liquids. Open containers shall not be used for transportation or storage. (33:6-5.1)

17-3.6.4.2* Wherever liquids are transferred from one container to another, both containers shall be effectively bonded and grounded to dissipate static electricity. (33:6-5.2)

17-3.6.4.3 Containers that supply spray nozzles shall be of the closed type or shall be provided with metal covers that are kept closed. Containers that do not rest on the floor shall have properly designed supports or shall be suspended by wire cables. Containers that supply spray nozzles by gravity flow shall not exceed 10-gal (38-L) capacity. (33:6-5.3)

17-3.7 Fire Protection Equipment Required.

17-3.7.1 Spray areas and mixing rooms shall be protected with an approved automatic fire extinguishing system. (33:7-1)

17-3.7.1.1 For continuous spray application operations, activation of the fire extinguishing system shall automatically accomplish all of the following:

- (1) Activate a local alarm in the vicinity of the spraying operation and activate the facility's alarm system, if such a system is provided.
- (2) Shut down the coating material delivery system.
- (3) Terminate all spray application operations.
- (4) Stop any conveyors into and out of the spray area.

(See Sections 17-3.7.7 and 17-3.7.8 for additional requirements for fixed powder application systems and fixed liquid electrostatic application systems.) (33:7-1.1)

17-3.7.1.2 Also for continuous spray application operations, a manual fire alarm and emergency system shut-down station shall be installed to serve each spray area. When activated, this station shall accomplish all of the functions listed in 17-3.7.1.1(1) through (4). At least one such station shall be within ready access of operating personnel. If access to this station is likely to involve exposure to danger, an additional station shall be located adjacent to an exit from the area. (33:7-1.2)

17-3.7.1.3 Air make-up and spray area exhaust systems shall not be interlocked with the fire alarm system and shall remain functioning during any fire alarm condition.

Exception No. 1: Where the type of fire extinguishing system used requires that ventilation be discontinued, air make-up and exhaust systems shall be permitted to be shut down and dampers shall be permitted to close.

Exception No. 2: For powder coating systems, the requirements of 17-3.7.7 shall be met instead of 17-3.7.1.3. (33:7-1.3)

17-3.7.2 The automatic sprinkler system in spray areas and mixing rooms shall meet all applicable requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*, for Extra Hazard (Group 2) occupancies.

Exception: As provided for in Section 15-3 of NFPA 33. (33:7-2.1)

17-3.7.3 Water supply for sprinklers shall be sufficient to supply all sprinklers likely to open in any one fire incident without depleting the available water for use in hose streams. Where sprinklers are installed to protect spray areas and mixing rooms only, water shall be permitted to be furnished from the domestic supply, subject to the approval of the authority having jurisdiction and provided the domestic supply can meet the design criteria for Extra Hazard (Group 2) occupancies, as defined in NFPA 13, *Standard for the Installation of Sprinkler Systems*. (33:7-2.3)

17-3.7.4 Sprinklers protecting spray areas and mixing rooms shall be protected against overspray residue so that they will operate quickly in event of fire. If covered, cellophane bags having a thickness of 0.003 in. (0.076 mm) or less, or thin paper bags shall be used. Coverings shall be replaced frequently so that heavy deposits of residue do not accumulate. Sprinklers that have been painted or coated, except by the

sprinkler manufacturer, shall be replaced with new listed sprinklers having the same characteristics. (33:7-2.5)

17-3.7.5 Where automatic sprinkler protection is not available or where another type of extinguishing means is better suited to provide the required protection for the spray application operation, spray areas and mixing rooms shall be permitted to be protected with a dry chemical extinguishing system installed in accordance with the requirements of NFPA 17, *Standard for Dry Chemical Extinguishing Systems*; a carbon dioxide system installed in accordance with the requirements of NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*; or a gaseous agent extinguishing system installed in accordance with NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*. (33:7-3.1)

17-3.7.6 An adequate supply of approved portable fire extinguishers shall be installed near all spray areas and mixing rooms. (See NFPA 10, *Standard for Portable Fire Extinguishers*.) (33:7-4)

17-3.7.7 Automated powder application equipment shall be protected further by the installation of an approved, supervised flame detection apparatus that shall, in event of ignition, react to the presence of flame within one-half (0.5) second and shall accomplish all of the following:

- (1) Shut down all energy supplies (electrical and compressed air) to conveyor, ventilation, application, transfer, and powder collection equipment.
- (2) Close segregation dampers in associated ductwork to interrupt airflows from application equipment to powder collectors.
- (3) Activate an alarm. (33:7-5)

17-3.7.8 Automated liquid electrostatic spray application equipment shall be further protected by the installation of an approved, supervised flame detection apparatus that shall, in the event of ignition, react to the presence of flame within one-half (0.5) second and shall accomplish all of the following:

- (1) Meet all of the requirements of 17-3.7.1.1.
- (2) Disconnect power to the high voltage elements in the spray area and de-energize the system. (33:7-6)

17-3.8 Operations and Maintenance.

17-3.8.1 Maintenance procedures shall be established to ensure that all spray application apparatus and processes are operated and maintained in accordance with the manufacturers' specifications and the requirements of NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*. Proper maintenance shall be the responsibility of the users of the apparatus and processes. (33:8-1)

17-3.8.2 Spray application operations shall not be conducted outside of predetermined spray areas, and all requirements of this Code and NFPA 33 that apply to spray areas shall be followed strictly. (33:8-1.1)

17-3.8.3 All spray areas shall be kept free of the accumulation of deposits of combustible residues. Combustible coverings (thin paper, plastic, etc.) and strippable coatings shall be permitted to be used to facilitate cleaning operations in spray areas. If residue accumulates to excess in booths, duct or duct discharge points, or other spray areas, then all spraying operations shall be discontinued until conditions are corrected. (33:8-2)

17-3.8.4 Maintenance Procedures.

17-3.8.4.1 Maintenance procedures shall be established to ensure that overspray collector filters are replaced before

excessive restriction to airflow occurs. Overspray collectors shall be inspected after each period of use, and clogged filters shall be discarded and replaced. (33:8-4.1)

17-3.8.4.2 All discarded overspray collector filters, residue scrapings, and debris contaminated with residue shall be removed immediately to a safe, well-detached location or placed in a water-filled metal container and disposed of at the close of the day's operation unless maintained completely submerged in water. (33:8-4.2)

17-3.8.5 Approved metal waste cans shall be provided wherever rags or waste are impregnated with sprayed material and all such rags or waste deposited therein immediately after use. The contents of waste cans shall be disposed of properly at least once daily at the end of each shift. (33:8-5)

17-3.8.6 Employees' clothing contaminated with sprayed material shall not be left on the premises overnight unless kept in metal lockers. (33:8-6)

17-3.8.7 Cleaning Solvents.

17-3.8.7.1 Solvents for cleaning operations shall have flash points above 100°F (37.8°C).

Exception: For cleaning spray nozzles and auxiliary equipment, solvents having flash points not less than those normally used in spray operations shall be permitted to be used. (33:8-7.1)

17-3.8.7.2 Cleaning operations using flammable or combustible solvents shall be conducted inside spray areas with ventilating equipment operating or in other adequately ventilated locations that meet the requirements of 17-3.4 through 17-3.4.7. (33:8-7.2)

17-3.8.8 "NO SMOKING OR OPEN FLAMES" signs in large letters on contrasting color background shall be conspicuously posted at all spray areas and paint storage rooms. (33:8-10)

17-3.8.9 Welding, cutting, and similar spark-producing operations shall not be permitted in or adjacent to spray areas until a written permit authorizing such work has been issued. The permit shall be issued by a person in authority following his or her inspection of the area to ensure that proper precautions have been taken and will be followed until the job is completed. (See NFPA 51B, *Standard for Fire Prevention in Use of Cutting and Welding Processes.*) (33:8-11)

17-3.9 Training. All personnel involved in the spray application processes covered by this chapter shall be instructed in the potential safety and health hazards; the operational, maintenance, and emergency procedures required; and the importance of constant operator awareness. (33:16-1)

17-3.9.1 Personnel required to handle or use flammable or combustible materials shall be instructed in the safe handling, storage, and use of the materials, as well as the emergency procedures that might be required. (33:16-1.1)

17-3.9.2 All personnel required to enter or to work within confined or enclosed spaces shall be instructed as to the nature of the hazard involved, the necessary precautions to be taken, and in the use of protective and emergency equipment required. (33:16-1.2)

17-3.9.3 All personnel shall be instructed in the proper use, maintenance, and storage of all emergency, safety, or personal protective equipment that they might be required to use in their normal work performance. (33:16-1.3)

17-3.9.4 Some appropriate form of documentation shall be employed to record the type and date of training provided to each individual involved in these processes. (33:16-1.4)

17-4 Dipping and Coating Processes.

17-4.1 Dipping and coating processes in which articles or materials are passed through tanks, vats, containers, or process equipment that contain flammable or combustible liquids shall comply with this section and NFPA 34, *Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids*. Such processes include, but are not limited to, dipping, roll coating, flow coating, curtain coating, and cleaning.

17-4.2 Section 17-4 shall not apply to processes involving non-combustible liquids.

Exception: Where certain waterborne liquids that contain flammable or combustible liquids or that produce combustible residues or deposits are used, the applicable provisions of this section shall apply.

17-4.3* Section 17-4 shall not apply to quench tanks that are addressed in Chapter 19 of this Code.

17-4.4* Where unusual industrial processes are involved, the authority having jurisdiction shall be permitted to require additional safeguards or modifications to the requirements of NFPA 34, *Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids*, provided equivalent safety is achieved.

17-5 Solvent Extraction.

17-5.1 Solvent extraction plants shall comply with this section and NFPA 36, *Standard for Solvent Extraction Plants*.

17-5.2 Application.

17-5.2.1 This section shall apply to the following:

- (1) The commercial scale extraction processing of animal and vegetable oils and fats by the use of Class I flammable hydrocarbon liquids, hereinafter referred to as solvents
- (2) Any equipment and buildings that are located within 100 ft (30 m) of the extraction process

Exception: As provided for in 17-5.2.1(3) through (6).

- (3) The unloading, storage, and handling of solvents, regardless of distance from the extraction process
- (4) The means of conveying material to be extracted from the preparation process to the extraction process
- (5) The means of conveying extracted desolventized solids and oil from the extraction process
- (6) Preparation and meal finishing processes that are connected by conveyor to the extraction process, regardless of intervening distance

17-5.2.2 This section shall not apply to the following:

- (1) The storage of raw materials or finished products
- (2) Extraction processes that use liquids that are miscible with water
- (3) Extraction processes that use flammable gases, liquefied petroleum gases, or nonflammable gases

17-5.2.3 The use of processes that employ oxygen-active compounds that are heat or shock sensitive, such as certain organic peroxides, shall be prohibited within the area defined in 17-5.2.1(2).

17-6* Handling Underground Releases of Flammable and Combustible Liquids. Handling of a suspected escape of flammable or combustible liquid shall be conducted by a means acceptable to the authority having jurisdiction.

Chapter 18 Hot Work Operations

18-1 General.

18-1.1 Welding, cutting, and use of torches shall comply with this chapter and NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*.

18-1.2 Acetylene cylinder charging plants shall comply with NFPA 51A, *Standard for Acetylene Cylinder Charging Plants*.

18-2 Fire Prevention Precautions.

18-2.1 Permissible Areas. Hot work shall be allowed only in areas that are or have been made fire safe. Hot work shall be performed in either designated areas or permit-required areas. (51B:3-1)

18-2.1.1 Designated Area. A designated area shall be a specific area designed or approved for such work, such as a maintenance shop or a detached outside location that is of noncombustible or fire-resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas. (51B:3-1.1)

18-2.1.2 Permit-Required Area. A permit-required area shall be an area that is made fire safe by removing or protecting combustibles from ignition sources. (51B:3-1.2)

18-2.2 Nonpermissible Areas. Hot work shall not be allowed in the following areas:

- (1) In areas not authorized by management
- (2) In sprinklered buildings while such protection is impaired
- (3) *In the presence of explosive atmospheres (that is, where mixtures of flammable gases, vapors, liquids, or dusts with air exist)
- (4) In explosive atmospheres that can develop inside uncleaned or improperly prepared drums, tanks, or other containers and equipment that have previously contained such materials
- (5) In explosive atmospheres that can develop in areas with an accumulation of combustible dusts (51B:3-2)

18-2.3 Hot Work Permit.

18-2.3.1 Permits, where required, shall comply with Section 1-16.

18-2.3.2* Before hot work operations begin in a nondesignated location, a written hot work permit by the permit authorizing individual (PAI) shall be required. (51B:3-3.1)

18-2.3.3 Before a hot work permit is issued, the following conditions shall be verified by the PAI:

- (1) Hot work equipment to be used shall be in satisfactory operating condition and in good repair.
- (2) Where combustible materials, such as paper clippings, wood shavings, or textile fibers, are on the floor, the floor shall be swept clean for a radius of 35 ft (11 m). Combustible floors (except wood on concrete) shall be kept wet, be covered with damp sand, or be protected by noncombustible or fire-retardant shields. Where floors have been wet down, personnel operating arc welding or cutting equipment shall be protected from possible shock.
- (3) *All combustibles shall be relocated at least 35 ft (11 m) horizontally from the work site. If relocation is impractical, combustibles shall be protected with fire-retardant

covers or otherwise shielded with metal or fire-retardant guards or curtains. Edges of covers at the floor shall be tight to prevent sparks from going under them, including where several covers overlap when protecting a large pile.

- (4) Openings or cracks in walls, floors, or ducts within 35 ft (11 m) of the site shall be tightly covered with fire-retardant or noncombustible material to prevent the passage of sparks to adjacent areas.
- (5) Conveyor systems that might carry sparks to distant combustibles shall be shielded.
- (6) If hot work is done near walls, partitions, ceilings, or roofs of combustible construction, fire-retardant shields or guards shall be provided to prevent ignition.
- (7) If hot work is to be done on a wall, partition, ceiling, or roof, precautions shall be taken to prevent ignition of combustibles on the other side by relocating combustibles. If it is impractical to relocate combustibles, a fire watch on the opposite side from the work shall be provided.
- (8) Hot work shall not be attempted on a partition, wall, ceiling, or roof that has a combustible covering or insulation, or on walls or partitions of combustible sandwich-type panel construction.
- (9) Hot work that is performed on pipes or other metal that is in contact with combustible walls, partitions, ceilings, roofs, or other combustibles shall not be undertaken if the work is close enough to cause ignition by conduction.
- (10) Fully charged and operable fire extinguishers that are appropriate for the type of possible fire shall be available immediately at the work area. If existing hose lines are located within the hot work area defined by the permit, they shall be connected and ready for service, but shall not be required to be unrolled or charged.
- (11) If hot work is done in close proximity to a sprinkler head, a wet rag shall be laid over the head and then removed at the conclusion of the welding or cutting operation. During hot work, special precautions shall be taken to avoid accidental operation of automatic fire detection or suppression systems (for example, special extinguishing systems or sprinklers).
- (12) Nearby personnel shall be suitably protected against heat, sparks, slag, and so on. (51B:3-3.2)

18-2.3.4* Based on local conditions, the PAI shall determine the length of the period for which the hot work permit is valid. (51B:3-3.3)

18-2.3.5* The area shall be inspected by the PAI at least once per day while the hot work permit is in effect to ensure that it is a fire-safe area. (51B:3-3.4)

18-2.4 Fire Watch.

18-2.4.1 A fire watch shall be required by the PAI when hot work is performed in a location where other than a minor fire might develop, or where the following conditions exist:

- (1) *Combustible materials in building construction or contents are closer than 35 ft (11 m) to the point of operation.
- (2) Combustible materials are more than 35 ft (11 m) away but are easily ignited by sparks.
- (3) Wall or floor openings within a 35-ft (11-m) radius expose combustible materials in adjacent areas, including concealed spaces in walls or floors.
- (4) Combustible materials are adjacent to the opposite side of partitions, walls, ceilings, or roofs and are likely to be ignited. (51B:3-4.1)

18-2.4.2 A fire watch shall be maintained for at least $1\frac{1}{2}$ hour after completion of hot work operations in order to detect and extinguish smoldering fires. (51B:3-4.2)

18-2.4.3* More than one fire watch shall be required if combustible materials that could be ignited by the hot work operation cannot be directly observed by the initial fire watch. (51B:3-4.3)

18-2.4.4 The fire watch shall be aware of the inherent hazards of the work site and of the hot work. (51B:2-4.1)

18-2.4.5 The fire watch shall ensure that safe conditions are maintained during hot work operations. (51B:2-4.2)

18-2.4.6 The fire watch shall have the authority to stop the hot work operations if unsafe conditions develop. (51B:2-4.3)

18-2.4.7* The fire watch shall have fire-extinguishing equipment readily available and shall be trained in its use. (51B:2-4.4)

18-2.4.8 The fire watch shall be familiar with the facilities and procedures for sounding an alarm in the event of a fire. (51B:2-4.5)

18-2.4.9 The fire watch shall watch for fires in all exposed areas and try to extinguish them only when the fires are obviously within the capacity of the equipment available. If the fire watch determines that the fire is not within the capacity of the equipment, he or she shall sound the alarm immediately. (51B:2-4.6)

18-3 Oxygen-Fuel Gas Systems.

18-3.1 General. The design and installation of oxygen-fuel gas systems for welding, cutting, and allied processes shall comply with this section and NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes*.

18-3.2 Cylinders and Containers.

18-3.2.1 Permits, where required, shall comply with Section 1-16.

18-3.2.2 Cylinders shall be designed, fabricated, tested, and marked (stamped) in accordance with regulations of the U.S. Department of Transportation (DOT), Transport Canada (TC), or the "Rules for the Construction of Unfired Pressure Vessels," Section VIII, ASME *Boiler and Pressure Vessel Code*. (51:2-1.1)

18-3.2.3* For the primary identification of cylinder, container, or manifold gas supply unit content, each cylinder, container, or unit shall be legibly marked with the name of the gas in accordance with CGA-C-4, *Method of Marking Portable Compressed Gas Containers to Identify the Material Contained*. These markings shall not be cut into the metal of the cylinder. (51:2-1.3)

18-3.2.4 Cylinders permitted inside of buildings shall be stored at least 20 ft (6 m) from flammable and combustible liquids and easily ignited forms of materials such as wood, paper, oil, and grease, and where they will not be exposed to excessive rise in temperature, physical damage, or tampering by unauthorized persons. (51:2-2.1)

18-3.2.5 Separate rooms or buildings used for gas cylinder storage shall be provided with natural or mechanical ventilation designed to provide a minimum of 1 cfm per sq ft ($0.3 \text{ m}^3/\text{m}^2$) of floor area. Ventilation systems shall discharge a minimum of 50 ft (15 m) from intakes of air handling systems, air conditioning equipment, and air compressors. (51:2-2.2)

18-3.2.6 Cylinders shall be secured in a manner so as to not be easily overturned.

18-3.2.7 Calcium carbide shall be stored in packages meeting DOT or TC regulations. (51:7-1.1)

18-3.3 Any person using a torch or other flame-producing device for removing paint, sweating pipe joints, or similar use in or around any building or structure or combustibles shall be responsible for the prevention of fire and shall comply with the following:

- (1) Provide, in a ready state, within 15 ft (4.6 m) travel distance of the work being done, either an approved fire extinguisher having a minimum 2A rating or a water hose connected to a reliable water supply. If a water hose is used as the approved extinguisher, it shall be charged and equipped with a suitable nozzle.
- (2) Provide shielding, wetting, or other approved means to protect combustible material in close proximity of the flame. Approved, stored pressure water fire extinguishers shall not be used to wet combustible material.
- (3) In all cases, the person operating the torch or a designee shall remain in the immediate vicinity for a minimum of 30 minutes or a period of time sufficient to ensure that no fire results from the work that was completed. This person's responsibilities shall include detecting and reporting any fire.

Chapter 19 Industrial Ovens and Furnaces

19-1 General.

19-1.1 Application. Industrial ovens and furnaces shall comply with this chapter and the applicable provisions of NFPA 86, *Standard for Ovens and Furnaces*; NFPA 86C, *Standard for Industrial Furnaces Using a Special Processing Atmosphere*; and NFPA 86D, *Standard for Industrial Furnaces Using Vacuum as an Atmosphere*.

19-1.2 Permits.

19-1.2.1 Permits, where required, shall comply with Section 1-16.

19-1.2.2 Applications for a permit shall be accompanied by plans showing all essential details and calculations for safe operation.

19-2 Location. Special consideration shall be given to the location of equipment using flammable liquids or when using gas fuels with a vapor density greater than air.

19-3 Safety Controls. Safety controls, as specified in NFPA 86, NFPA 86C, and NFPA 86D, shall be sufficient in number and substantially constructed and arranged to maintain the required conditions of safety and prevent the development of fire and explosion hazards.

Chapter 20 Laboratories Using Chemicals

20-1 General.

20-1.1* The handling or storing of chemicals in laboratory buildings, laboratory units, and laboratory work areas whether located above or below grade shall comply with this chapter and NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*.

20-1.2 This chapter shall apply to substances with one or more of the following hazard ratings as defined in NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*:

Health — 2, 3, or 4

Flammability — 2, 3, or 4

Reactivity — 2, 3, or 4

20-1.3 This chapter shall not apply to the following:

- (1) Laboratory units with less than or equal to 4 L (1.1 gal) of flammable or combustible liquid and less than 2.2 standard m³ (75 standard ft³) of flammable gas
- (2) Laboratories that are pilot plants
- (3) Laboratories that are primarily manufacturing plants
- (4) Incidental testing facilities
- (5) Physical, electronic, instrument, laser, or similar laboratories that use chemicals only for incidental purposes, such as cleaning
- (6) *Laboratories that work only with radioactive materials
- (7) Laboratories that work only with explosive material that are covered by NFPA 495, *Explosive Materials Code*

20-2 Laboratories in Health Care Occupancies.

20-2.1 Any building, space, room, or group of rooms in a health care facility intended to serve activities involving procedures for investigation, diagnosis, or treatment in which flammable, combustible, or oxidizing materials are to be used shall comply with Section 20-1 and Chapter 10 of NFPA 99, *Standard for Health Care Facilities*.

20-2.2 The requirements of 20-2.1 shall not apply to isolated frozen section laboratories; areas in which oxygen is administered; blood donor rooms in which flammable, combustible, or otherwise hazardous materials normally used in laboratory procedures are not present; and clinical service areas not using hazardous materials.

20-3 Permits. Permits, where required, shall comply with Section 1-16.

Chapter 21 Liquefied Petroleum Gases and Liquefied Natural Gases

21-1 General Provisions.

21-1.1 Application.

21-1.1.1 The storage and handling of liquefied petroleum gases (LP-Gas) shall be in accordance with this chapter and NFPA 58, *Liquefied Petroleum Gas Code*.

21-1.1.2 Plans for stationary installations utilizing storage containers of over 2000 gal (7.6 m³) individual water capacity, or with aggregate water capacity exceeding 4000 gal (15.1 m³), and all rooftop installations of ASME containers, shall be submitted to the authority having jurisdiction before the installation is started. The fire department shall be advised of each such installation. (58:1-4.1)

21-1.2 Permits. Permits, where required, shall comply with Section 1-16.

21-2 LP-Gas Equipment and Appliances.

21-2.1 Containers.

21-2.1.1 Refrigerated containers shall comply with Chapter 9 of NFPA 58, *Liquefied Petroleum Gas Code*. (58:2-2.1.2)

21-2.1.2* Containers shall be designed, fabricated, tested, and marked (or stamped) in accordance with the Regulations of the U.S. Department of Transportation (DOT), the ASME *Boiler and Pressure Vessel Code*, "Rules for the Construction of Unfired Pressure Vessels," Section VIII, or the API-ASME *Code for Unfired Pressure Vessels for Petroleum Liquids and Gases*, whichever is applicable at the date of manufacture. (See *Appendixes C and D of NFPA 58*.) The following shall also apply:

- (1) Adherence to applicable ASME Code Case Interpretations and Addenda shall be considered as compliance with the ASME Code.
- (2) Containers fabricated to earlier editions of regulations, rules, or codes listed in 21-2.1.2 and the ICC *Rules for Construction of Unfired Pressure Vessels*, prior to April 1, 1967, shall be permitted to be continued to be used in accordance with 1-1.5 of NFPA 58. (58:2-2.1.3)

21-2.1.3 Containers that show serious denting, bulging, gouging, or excessive corrosion shall be removed from service. (58:2-2.1.8)

21-2.1.4 Repair or alteration of containers shall comply with the regulations, rules, or code under which the container was fabricated. Other welding shall be permitted only on saddle plates, lugs, or brackets attached to the container by the container manufacturer. (58:2-2.1.9)

21-2.1.5 Containers for general use shall not have individual water capacities greater than 120,000 gal (454 m³). Containers in dispensing stations shall have an aggregate water capacity not greater than 30,000 gal (114 m³). This capacity restriction shall not apply to LP-Gas bulk plants, industrial plants, or industrial applications. (58:2-2.1.10)

21-2.1.6 Cylinders of 1000 lb (454 kg) water capacity [nominal 420 lb (191 kg) LP-Gas capacity] or less shall incorporate protection against physical damage to cylinder appurtenances and immediate connections to these when in transit, when in storage, when being moved into position for use, and when in

use, except in residential and commercial installations, by the following:

- (1) A ventilated cap or collar designed to permit pressure relief valve discharge and capable of withstanding a blow from any direction equivalent to that of a 30-lb (14-kg) weight dropped 4 ft (1.2 m). Construction shall be such that the force of the blow will not be transmitted to the valve.
- (2) Collars shall be designed so that they do not interfere with the free operation of the cylinder valve. (58:2-2.4.1)

21-2.1.7 Portable containers of more than 1000 lb (454 kg) water capacity [nominal 420 lb (191 kg) LP-Gas capacity], including skid tanks or for use as cargo containers, shall incorporate protection against physical damage to container appurtenances by recessing, by protective housings, or by location on the vehicle. Such protection shall comply with the provisions under which the tanks are fabricated and shall be designed to withstand static loadings in any direction equal to twice the weight of the container and attachments when filled with LP-Gas, using a safety factor of not less than four, based on the ultimate strength of the material to be used. (See *Chapters 3 and 6 of NFPA 58 for additional provisions applying to the LP-Gas system used*.) (58:2-2.4.2)

21-2.1.8 Horizontal ASME containers of 2000 gal (7.6 m³) water capacity or less designed for permanent installation in stationary service shall be permitted to be equipped with non-fireproofed structural steel supports and designed to allow mounting on firm foundations in accordance with the following:

- (1) For installation on concrete foundations raised above the ground level by more than 12 in. (300 mm), the structural steel supports shall be designed so that the bottoms of the horizontal members are not less than 2 in. (51 mm) nor more than 12 in. (300 mm) below the outside bottom of the container shell.
- (2) For installation on paved surfaces or concrete pads within 4 in. (102 mm) of ground level, the structural steel supports shall be permitted to be designed so that the bottoms of the structural members are not more than 24 in. (610 mm) below the outside bottom of the container shell. [See 3-2.4.2(a) (4) of NFPA 58 for installation provisions for such containers, which are customarily used as components of prefabricated container-pump assemblies.] (58:2-2.5.2)

21-2.1.9 ASME containers that are used as portable storage containers (see *definition of Portable Container in Section 1-6 of NFPA 58*) for temporary (less than 6 months at any given location) stationary service and are moved only when substantially empty of liquid shall comply with the following (this shall apply to movable fuel storage tenders including farm carts):

- (1) If mounted on legs or supports, then such supports shall be of steel and either shall be welded to the container by the manufacturer at the time of fabrication or shall be attached to lugs that have been so welded to the container. The legs or supports or the lugs for the attachment of these legs or supports shall be secured to the container in accordance with the code or rule under which the container was designed and built, with a minimum safety factor of four, to withstand loading in any direction equal to twice the weight of the empty container and attachments.
- (2) If the container is mounted on a trailer or semi-trailer running gear so that the unit can be moved by a conven-

tional over-the-road tractor, then attachment to the vehicle, or attachments to the container to make it a vehicle, shall comply with the appropriate DOT requirements for cargo tank service, except that stress calculations shall be based on twice the weight of the empty container. The unit also shall comply with applicable state and DOT motor carrier regulations and shall be approved by the authority having jurisdiction. (58:2-2.5.4)

21-2.1.10 Container Markings.

21-2.1.10.1 Containers shall be marked as provided in the regulations, rules, or code under which they are fabricated and shall be in accordance with the following:

- (1) Where LP-Gas and one or more other compressed gases are to be stored or used in the same area, the cylinders shall be marked "Flammable" and either "LP-Gas," "LP-GAS," "Propane," or "Butane." Compliance with marking requirements of Title 49 of the *Code of Federal Regulations* shall meet this provision.
- (2) When being transported, cylinders shall be marked and labeled in accordance with Title 49 of the *Code of Federal Regulations*. (58:2-2.6.1)

21-2.1.10.2 Cylinders shall be marked with the following information:

- (1) The water capacity of the cylinder in pounds
- (2) The tare weight of the cylinder in pounds, fitted for service. The tare weight is the cylinder weight plus the weight of all permanently attached valves and other fittings but does not include the weight of protecting devices that are removed in order to load the cylinder. (58:2-2.6.2)

21-2.1.10.3 ASME containers shall be marked in accordance with the following:

- (1) The marking specified shall be on a stainless steel metal nameplate attached to the container, located to remain visible after the container is installed. The nameplate shall be attached in such a way as to minimize corrosion of the nameplate or its fastening means and not contribute to corrosion of the container.

Exception: Where the container is buried, mounded, insulated, or otherwise covered so the nameplate is obscured the information contained on the nameplate shall be duplicated and installed on adjacent piping or on a structure in a clearly visible location.

- (2) Service for which the container is designed (for example, underground, aboveground, or both)
- (3) Name and address of container supplier or trade name of container
- (4) Water capacity of container in pounds or U.S. gallons
- (5) Design pressure in pounds per square inch
- (6) The wording "This container shall not contain a product that has a vapor pressure in excess of psi at 100°F" (See Table 2-2.2.2 of NFPA 58.)
- (7) Outside surface area in square feet
- (8) Year of manufacture
- (9) Shell thickness and head thickness
- (10) OL, OD, HD

(11) Manufacturer's serial number

(12) ASME Code symbol (58:2-2.6.3)

21-2.2 Container Appurtenances. Container appurtenances shall be fabricated of materials that are suitable for LP-Gas service and, shall be resistant to the action of LP-Gas under service conditions, and shall comply with Section 2-3 of NFPA 58, *Liquefied Petroleum Gas Code*.

21-2.3 Piping (Including Hose), Fittings, and Valves.

21-2.3.1 Piping (including hose), fittings, and valves shall comply with Section 2-4 of NFPA 58.

21-2.3.2 Emergency shutoff valves shall be approved and shall incorporate all of the following means of closing:

- (1) Automatic shutoff through thermal (fire) actuation. Where fusible elements are used, they shall have a melting point not exceeding 250°F (121°C).
- (2) Manual shutoff from a remote location.
- (3) Manual shutoff at the installed location. (58:2-4.5.4)

21-2.3.3 Hose, hose connections, and flexible connectors shall be fabricated of materials that are resistant to the action of LP-Gas both as liquid and vapor. If wire braid is used for reinforcement, it shall be of corrosion-resistant material such as stainless steel. (58:2-4.6.1)

21-2.3.4 Hydrostatic relief valves designed to relieve the hydrostatic pressure that might develop in sections of liquid piping between closed shutoff valves shall have pressure settings not less than 400 psi (2.8 MPa) or more than 500 psi (3.5 MPa) unless installed in systems designed to operate above 350 psi (2.4 MPa). Hydrostatic relief valves for use in systems designed to operate above 350 psi (2.4 MPa) shall have settings not less than 110 percent or more than 125 percent of the system design pressure. (58:2-4.7)

21-3 Installation of LP-Gas Systems.

21-3.1 General Provisions.

21-3.1.1 Location of Containers.

21-3.1.1.1 Containers installed outside of buildings, whether of the portable type replaced on a cylinder exchange basis or permanently installed and refilled at the installation, shall be located with respect to the nearest container, important building, group of buildings, or line of adjoining property that can be built upon, in accordance with the following and Table 21-3.1.1.1, Table 21-3.1.1.3, and Table 21-3.1.1.6(6).

- (1) At a consumer site, if the aggregate water capacity of a multicontainer installation comprised of individual containers having a water capacity of less than 125 gal (0.5 m³) is 501 gal (1.9 m³) or more, the minimum distance shall comply with the appropriate portion of Table 21-3.1.1.1, applying the aggregate capacity rather than the capacity per container. If more than one such installation is made, each installation shall be separated from any other installation by at least 25 ft (7.6 m). The minimum distances between containers shall not be applied to such installations.

Table 21-3.1.1.1

| Water Capacity per Container gallons (m ³) | Minimum Distances ft (m) | | |
|--|---|---|---|
| | Mounded or Underground Containers [see 21-3.1.1.1(6)] | Aboveground Containers [see 21-3.1.1.1(8)] | Between Containers [see 21-3.1.1.1(7)] |
| Less than 125 (0.5) [see 21-3.1.1.1(1)] | 10 (3) | None [see 21-3.1.1.1(2), (3), and (4)] | None |
| 125 to 250 (0.5 to 1.0) | 10 (3) | 10 (3) | None |
| 251 to 500 (1.0+ to 1.9) | 10 (3) | 10 (3) | 3 (1) |
| 501 to 2,000 (1.9+ to 7.6) | 10 (3) | 25 (7.6) [see 21-3.1.1.1(5)] | 3 (1) |
| 2,001 to 30,000 (7.6+ to 114) | 50 (15) | 50 (15) | 5 (1.5) |
| 30,001 to 70,000 (114+ to 265) | 50 (15) | 75 (23) | * |
| 70,001 to 90,000 (265+ to 341) | 50 (15) | 100 (30) | * |
| 90,001 to 120,000 (341+ to 454) | 50 (15) | 125 (38) | * |
| 120,001 to 200,000 (454 to 757) | 50 (15) | 200 (61) | * |
| 200,001 to 1,000,000 (757 to 3,785) | 50 (15) | 300 (91) | * |
| Over 1,000,000 (3,785) | 50 (15) | 400 (122) | * |

*One-quarter of the sum of the diameters of adjacent containers.
(58:Table 3-2.2.2)

- (2) Cylinders installed alongside of buildings shall be located and installed so that the discharge from the cylinder pressure relief device is at least 3 ft (1 m) horizontally away from any building opening that is below the level of such discharge. Cylinders shall not be located and installed underneath any building unless the space is not enclosed for more than 50 percent of its perimeter. The discharge from container pressure relief devices shall be located not less than 5 ft (1.5 m) in any direction away from any exterior source of ignition, openings into direct-vent (sealed combustion system) appliances, or mechanical ventilation air intakes.
- (3) The distance measured horizontally from the point of discharge of a container pressure relief valve to any building opening below the level of such discharge shall be in accordance with Table 21-3.1.1.1(4).
- (4) The distance measured in any direction from the point of discharge of a container pressure relief valve, the vent of a fixed maximum liquid level gauge on a container, or the installed location of the filling connection of a container to any exterior source of ignition, openings into direct-vent (sealed combustion system) appliances, or mechanical ventilation air intakes shall be in accordance with Table 21-3.1.1.1(4).
- (5) The 25 ft (7.6 m) distance from aboveground containers of 501 gal to 2000 gal (1.9 m³ to 7.6 m³) capacity to buildings, group of buildings, or line of adjoining property that can be built upon shall be permitted to be reduced to not less than 10 ft (3 m) for a single container of 1200 gal (4.5 m³) water capacity or less provided such container is at least 25 ft (7.6 m) from any other LP-Gas container of more than 125 gal (0.5 m³) water capacity.

Table 21-3.1.1.1(4)

| Container Type | Exchange or Filled on Site | Distance Horizontally from Relief Valve Discharge to Opening Below Discharge ft | Discharge from Relief Valve, Vent Discharge, and Filling Connection to Exterior Source of Ignition, Openings into Direct-Vent Appliances, Mechanical Ventilation Air Intakes ft |
|----------------|----------------------------|---|---|
| Cylinder | Exchange | 3 | 5 |
| Cylinder | Filled on site | 3 | 10 |
| ASME | Filled on site | 5 | 10 |

[58:Table 3-2.2.2(d)]

- (6) Minimum distances for underground or mounded ASME containers of 2001 gal through 30,000 gal (7.6 m³ through 114 m³) water capacity incorporating all the provisions of Section 3-11 shall be permitted to be reduced to 10 ft (3 m). Distances for all underground and mounded ASME containers shall be measured from the relief valve and the filling connection. No part of an underground ASME container shall be less than 10 ft (3 m) from a building or line of adjoining property that can be built upon, and no part of a mounded ASME container that is installed above grade shall be less than 5 ft (1.5 m) from a building or line of adjoining property that can be built upon.
- (7) Where underground multicontainer installations are made of individual containers having a water capacity of 125 gal (0.5 m³) or more, such containers shall be

installed so as to permit access at their ends or sides to facilitate working with cranes or hoists.

- (8) In applying the distance between buildings and ASME containers of 125 gal (0.5 m³) or more water capacity, a minimum of 50 percent of this horizontal distance shall also apply to all portions of the building that project more than 5 ft (1.5 m) from the building wall and that are higher than the relief valve discharge outlet. This horizontal distance shall be measured from a point determined by projecting the outside edge of such overhanging structure vertically downward to grade or other level upon which the container is installed. Under no condition shall the distances to the building wall be less than those specified except when the provisions of 3-11.3 and 3-11.4 of NFPA 58 are met. These distances shall be permitted to be reduced by one-half for ASME containers of 2001 gal through 30,000 gal (7.6 m³ through 114 m³) water capacity used in systems complying with Section 3-11 of NFPA 58.

Exception: Not applicable to installations in which overhanging structure is 50 ft (15 m) or more above the relief valve discharge outlet. (58:3.2.2.2)

21-3.1.1.2 Where storage containers having an aggregate water capacity of more than 4000 gal (15.1 m³) are located in heavily populated or congested areas, the siting provisions of 21-3.1.1.1 and Table 21-3.1.1.1 shall be permitted to be modified as indicated by the fire safety analysis described in 21-3.4.1.3. (58:3.2.2.3)

21-3.1.1.3 Aboveground multicontainer installations comprised of containers having an individual water capacity of 12,000 gal (45 m³) or more installed for use in a single location shall be limited to the number of containers in one group, and with each group separated from the next group in accordance with the degree of fire protection provided in Table 21-3.1.1.3.

The separation distance between groups of ASME containers protected by hose stream only shall be permitted to be reduced by one-half when the provisions of 3-11.3 and 3-11.4 of NFPA 58 are met. (58:3.2.2.4)

Table 21-3.1.1.3

| Fire Protection Provided by | Maximum Number of Containers in One Group | Minimum Separation between Groups ft (m) |
|--|--|---|
| Hose streams only (<i>see</i> 21-3.1.1.3 and 21-3.4.1.3) | 6 | 50 (15) |
| Fixed monitor nozzles per 21-3.4.2.5 | 6 | 25 (7.6) |
| Fixed water spray per 21-3.4.2.4 | 9 | 25 (7.6) |
| Insulation per 21-3.4.2.1 | 9 | 25 (7.6) |

(58:Table 3.2.2.4)

21-3.1.1.4 Underground or mounded containers shall be located outside of any buildings. Buildings shall not be constructed over any underground or mounded containers. Sides of adjacent containers shall be separated in accordance with Table 21-3.1.1.1 but not less than 3 ft (1 m).

Where containers are installed parallel with ends in line, any number of containers shall be permitted to be in one group. Where more than one row is installed, the adjacent

ends of the tanks in each row shall be separated by not less than 10 ft (3 m). (58:3.2.2.5)

21-3.1.1.5 In the case of buildings of other than wood-frame construction devoted exclusively to gas manufacturing and distribution operations, the distances specified in Table 21-3.1.1.1 shall be permitted to be reduced provided that containers having a water capacity exceeding 500 gal (1.9 m³) shall not be located closer than 10 ft (3 m) to such gas manufacturing and distributing buildings. (58:3.2.2.6)

21-3.1.1.6 The following provisions shall also apply:

- (1) Containers shall not be stacked one above the other.
- (2) Loose or piled combustible material and weeds and long dry grass shall not be permitted within 10 ft (3.0 m) of any container.
- (3) *Means shall be used to prevent the accumulation or flow of liquids having flash points below 200°F (93.4°C) under adjacent LP-Gas containers such as by dikes, diversion curbs, or grading.
- (4) LP-Gas containers shall be located at least 10 ft (3.0 m) from the centerline of the wall of diked areas containing flammable or combustible liquids.
- (5) The minimum horizontal separation between aboveground LP-Gas containers and aboveground tanks containing liquids having flash points below 200°F (93.4°C) shall be 20 ft (6 m). No horizontal separation shall be required between aboveground LP-Gas containers and underground tanks containing flammable or combustible liquids installed in accordance with NFPA 30, *Flammable and Combustible Liquids Code*.

Exception: This provision shall not apply where LP-Gas containers of 125 gal (0.5 m³) or less water capacity are installed adjacent to fuel oil supply tanks of 660 gal (2.5 m³) or less capacity.

- (6) *The minimum separation between LP-Gas containers and oxygen or gaseous hydrogen containers shall be in accordance with Table 21-3.1.1.6(6) of this document.

Exception: Shorter distances shall be permitted where protective structures having a minimum fire resistance rating of 2 hours interrupt the line of sight between uninsulated portions of the oxygen or hydrogen containers and the LP-Gas containers. The location and arrangement of such structures shall minimize the problems cited in A-21-3.1.1.7.

- (7) The minimum separation between LP-Gas containers and liquefied hydrogen containers shall be in accordance with NFPA 50B, *Standard for Liquefied Hydrogen Systems at Consumer Sites*.
- (8) Where necessary to prevent flotation due to possible high flood waters around aboveground or mounded containers, or high water table for those underground and partially underground, containers shall be securely anchored.
- (9) Where LP-Gas containers are to be stored or used in the same area with other compressed gases, the containers shall be marked to identify their content in accordance with ANSI/CGA C-4, *Method of Marking Portable Compressed Gas Containers to Identify the Material Contained*.
- (10) No part of an aboveground LP-Gas container shall be located in the area 6 ft (1.8 m) horizontally from a vertical plane beneath overhead electric power lines that are over 600 volts, nominal. (58:3-2.2.7)

21-3.1.1.7* Structures such as fire walls, fences, earth or concrete barriers, and other similar structures, shall be avoided around or over installed nonrefrigerated containers.

Table 21-3.1.1.6(6)

| LP-Gas Containers Aggregate Water Capacity gal (m ³) | Separation from Oxygen Containers Aggregate Capacity | | | Separation from Gaseous Hydrogen Containers Aggregate Capacity | | |
|--|---|--|--|--|--|---|
| | 400 ft ³ (11 m ³)* or less | More than 400 ft ³ (11 m ³)* to 20,000 ft ³ (566 m ³)* including unconnected reserves ft (m) | More than 20,000 ft ³ (566 m ³)* including unconnected reserves ft (m) | Less than 400 ft ³ (11 m ³)* | 400 ft ³ (11 m ³)* to 3000 ft ³ (85 m ³)* ft (m) | More than 3000 ft ³ (85 m ³)* ft (m) |
| 1200 (4.5) or less | None | 20 (6) | 25 (7.6) | — | — | — |
| Over 1200 (4.5) | None | 20 (6) | 50 (15) | — | — | — |
| 500 (1.9) or less | — | — | — | None | 10 (3) | 25 (7.6) |
| Over 500 (1.9) | — | — | — | None | 25 (7.6) | 50 (15) |

*Cubic feet (m³) measured at 70°F (21°C) and atmospheric pressure.
[58:Table 3-2.2.7(f)]

Exception No. 1: Such structures partially enclosing containers shall be permitted if designed in accordance with a sound fire protection analysis.

Exception No. 2: Structures used to prevent flammable or combustible liquid accumulation or flow shall be permitted in accordance with 21-3.1.1.6(3) of this document.

Exception No. 3: Structures between LP-Gas containers and gaseous hydrogen containers shall be permitted in accordance with 21-3.1.1.6(6) of this document.

Exception No. 4: Fences shall be permitted in accordance with 21-3.2.1 of this document. (58:3-2.2.9)

21-3.1.2 Installation of Containers. Containers shall be installed in accordance with the following:

- (1) Cylinders shall be installed only aboveground, and shall be set upon a firm foundation or be otherwise firmly secured. Flexibility shall be provided in the connecting piping. (See 3-2.10.6 and 3-2.10.10 of NFPA 58.)
- (2) All containers shall be positioned so that the pressure relief valve is in direct communication with the vapor space of the container.
- (3) Where physical damage to LP-Gas containers, or systems of which they are a part, from vehicles is a possibility, precautions shall be taken against such damage.
- (4) The installation position of ASME containers shall make all container appurtenances accessible for their normally intended use.
- (5) Field welding on containers shall be limited to attachments to nonpressure parts, such as saddle plates, wear plates, or brackets applied by the container manufacturer. Welding to container proper shall comply with 21-2.1.4 of this document.
- (6) *Aboveground containers shall be kept properly painted. (58:3-2.4.1)

21-3.1.3 Installation of Pipe, Tubing, Pipe and Tubing Fittings, Valves, and Hose.

21-3.1.3.1 Provision shall be made in piping including interconnecting of permanently installed containers, to compensate for expansion, contraction, jarring and vibration, and for settling. Where necessary, flexible connectors complying with 2-4.6 of NFPA 58 shall be permitted to be used. (See 3-2.10.10 of NFPA 58.) The use of nonmetallic pipe, tubing, or hose for permanently interconnecting such containers shall be prohibited. (58:3-2.10.6)

21-3.1.3.2 Underground metallic piping shall be protected against corrosion as warranted by soil conditions. (See 3-2.14 of NFPA 58.)

LP-Gas piping shall not be used as a grounding electrode. (58:3-2.10.9)

21-3.1.3.3 Hose shall be permitted to be used on the low-pressure side of regulators to connect to other than domestic and commercial appliances as follows:

- (1) The appliance connected shall be of a portable type.
- (2) For use inside buildings, the hose shall be of a minimum length, not exceeding 6 ft (1.8 m) [except as provided in 3-4.2.3(b) of NFPA 58], and shall not extend from one room to another nor pass through any partitions, walls, ceilings, or floors (except as provided for in 21-3.3.2.7). It shall not be concealed from view or used in concealed locations. For use outside buildings, hose length shall be permitted to exceed 6 ft (1.8 m) but shall be kept as short as practical.
- (3) Hose shall be securely connected to the appliance. The use of rubber slip ends shall not be permitted.
- (4) A shutoff valve shall be provided in the piping immediately upstream of the inlet connection of the hose. Where more than one such appliance shutoff is located near another, precautions shall be taken to prevent operation of the wrong valve.
- (5) Hose used for connecting appliances to wall or other outlets shall be protected against physical damage. (58:3-2.10.12)

21-3.1.4 Vehicle Fuel Dispenser and Dispensing Stations.

21-3.1.4.1 Application. The location, installation, and operating provisions for vehicle fuel dispensers and dispensing stations shall comply with 21-3.1.4.1 through 21-3.1.4.4.3. The general provisions of Section 3-2 of NFPA 58 shall apply unless specifically modified in 21-3.1.4.1 through 21-3.1.4.4.3.

21-3.1.4.2 Location.

21-3.1.4.2.1 Location shall be in accordance with Table 3-2.3.3 of NFPA 58. (58:3-9.2.1)

21-3.1.4.2.2 Vehicle fuel dispensers and dispensing stations shall be located away from pits in accordance with Table 3-2.3.3 of NFPA 58, with no drains or blow-offs from the unit directed toward or within 15 ft (4.6 m) of a sewer system's opening. (58:3-9.2.2)

21-3.1.4.3 General Installation Provisions.

21-3.1.4.3.1 Vehicle fuel dispensers and dispensing stations shall be installed as recommended by the manufacturer. (58:3-9.3.1)

21-3.1.4.3.2 Installation shall not be within a building but shall be permitted to be under weather shelter or canopy, provided this area is adequately ventilated and is not enclosed for more than 50 percent of its perimeter. (58:3-9.3.2)

21-3.1.4.3.3 Control for the pump used to transfer LP-Gas through the unit into containers shall be provided at the device in order to minimize the possibility of leakage or accidental discharge. (58:3-9.3.3)

21-3.1.4.3.4 An excess-flow check valve complying with 2-3.3.3(b) of NFPA 58 or an emergency shutoff valve complying with 21-2.3.2 shall be installed in or on the dispenser at the point at which the dispenser hose is connected to the liquid piping. A differential back pressure valve shall be considered as meeting this provision. (58:3-9.3.4)

21-3.1.4.3.5 Piping and the dispensing hose shall be provided with hydrostatic relief valves as specified in 3-2.11 of NFPA 58. (58:3-9.3.5)

21-3.1.4.3.6 Protection against trespassing and tampering shall be in accordance with 21-3.2.1. (58:3-9.3.6)

21-3.1.4.3.7 A manual shutoff valve and an excess-flow check valve of suitable capacity shall be located in the liquid line between the pump and dispenser inlet where the dispensing device is installed at a remote location and is not part of a complete storage and dispensing unit mounted on a common base. (58:3-9.3.7)

21-3.1.4.3.8 All dispensers shall either be installed on a concrete foundation or be part of a complete storage and dispensing unit mounted on a common base and installed in accordance with 3-2.4.2(a) 3 and 2-2.5.2(a) and (b) of NFPA 58. Protection shall be provided against physical damage. (58:3-9.3.8)

21-3.1.4.3.9 A listed quick-acting shutoff valve shall be installed at the discharge end of the transfer hose. (58:3-9.3.9)

21-3.1.4.3.10 A clearly identified and an easily accessible switch(es) or circuit breaker(s) shall be provided at a location not less than 20 ft (6.1 m) nor more than 100 ft (30.5 m) from the dispensing device(s) to shut off the power in the event of a fire, accident, or other emergency. The marking for the switch(es) or breaker(s) shall be visible at the point of liquid transfer. (58:3-9.3.10)

21-3.1.4.4 Installation of Vehicle Fuel Dispensers.

21-3.1.4.4.1 Hose length shall not exceed 18 ft (5.5 m). All hose shall be listed. When not in use, hose shall be secured to protect it from damage.

Exception: Hoses longer than 18 ft (5.5 m) shall be permitted where approved by the authority having jurisdiction. (58:3-9.4.1)

21-3.1.4.4.2 A listed emergency breakaway device complying with UL 567, *Standard Pipe Connectors for Flammable and Combustible Liquids and LP-Gas*, and designed to retain liquid on both sides of the breakaway point, or other devices affording equivalent protection approved by the authority having jurisdiction, shall be installed. (58:3-9.4.2)

21-3.1.4.4.3 Dispensing devices for liquefied petroleum gas shall be located at least 10 ft (3.0 m) for conventional systems

and at least 3 ft (1 m) for low emission transfer systems in accordance with Section 3-11 of NFPA 58 from any dispensing device for Class I liquids. (58:3-9.4.3)

21-3.2 Distributing and Industrial LP-Gas Systems.

21-3.2.1 Protection against Tampering for Systems at Bulk Plants, Industrial Plants, and Vehicle Fuel Dispensing Stations. To minimize the possibilities for trespassing and tampering, the area that includes container appurtenances, pumping equipment, loading and unloading facilities, and container filling facilities shall be protected by one of the following methods:

- (1) Enclosure with at least a 6-ft (1.8-m) high industrial-type fence, unless otherwise adequately protected. There shall be at least two means of emergency access from the fenced or other enclosure. Clearance shall be provided to allow maintenance to be performed, and a clearance of at least 3 ft (1.0 m) shall be provided to allow emergency access to the required means of egress. If guard service is provided, it shall be extended to the LP-Gas installation. Guard personnel shall be properly trained.

Exception: If a fenced or otherwise enclosed area is not over 100 ft² (9 m²) in area, the point of transfer is within 3 ft (1.0 m) of a gate and containers being filled are not located within the enclosure, a second gate shall not be required.

- (2) As an alternate to fencing the operating area, suitable devices that can be locked in place shall be provided. Such devices, when in place, shall effectively prevent unauthorized operation of any of the container appurtenances, system valves, or equipment. (58:3-3.6)

21-3.2.2 Lighting. If operations are normally conducted during other than daylight hours, lighting shall be provided to illuminate storage containers, containers being loaded, control valves, and other equipment. (58:3-3.7)

21-3.3 LP-Gas Systems in Buildings or on Building Roofs or Exterior Balconies.**21-3.3.1 General Provisions for Cylinders, Equipment, Piping, and Appliances.**

21-3.3.1.1 Cylinders, regulating equipment, manifolds, pipe, tubing, and hose shall be located to minimize exposure to abnormally high temperatures (such as might result from exposure to convection and radiation from heating equipment or installation in confined spaces), physical damage, or tampering by unauthorized persons. (58:3-4.2.4)

21-3.3.1.2 Heat-producing equipment shall be located and used to minimize the possibility of the ignition of combustibles. (58:3-4.2.5)

21-3.3.1.3 Where cylinders are located on a floor, roof, or balcony, provisions shall be made to minimize the possibility of cylinders falling over the edge. (58:3-4.2.6)

21-3.3.1.4 Transportation (movement) of cylinders within a building shall comply with the following:

- (1) Containers having water capacities greater than 2.7 lb (1.2 kg) within a building shall be restricted to movement directly associated with the uses covered by 21-3.3.2 through 21-3.3.8 and shall be conducted in accordance with these provisions and 21-3.3.1.4(2) through (4).

- (2) Valve outlets on cylinders having water capacities greater than 2.7 lb (1.2 kg) shall be tightly plugged or capped and shall comply with the provisions of 21-2.1.6.
- (3) Only emergency stairways not generally used by the public shall be used, and precautions shall be taken to prevent the cylinder from falling down the stairs.
- (4) Freight or passenger elevators shall be permitted to be used when occupied only by those engaged in moving the cylinder. (58:3-4.2.7)

21-3.3.1.5 Portable heaters, including salamanders, shall be equipped with an approved automatic device to shut off the flow of gas to the main burner and to the pilot, if used, in the event of flame extinguishment or combustion failure. Such portable heaters shall be self-supporting unless designed for cylinder mounting (see 21-3.3.2.4). Cylinder valves, connectors, regulators, manifolds, piping, or tubing shall not be used as structural supports. The following shall also apply.

Portable heaters manufactured on or after May 17, 1967, having an input of more than 50,000 Btu/hr (53 MJ/hr), and those manufactured prior to May 17, 1967, with inputs of more than 100,000 Btu/hr (105 MJ/hr), shall be equipped with either of the following:

- (1) A pilot that must be lighted and proved before the main burner can be turned on
- (2) An approved electric ignition system.

Exception: The provisions of 21-3.3.1.5 shall not be applicable to the following:

- (a) Tar kettle burners, hand torches, or melting pots.
- (b) Portable heaters with less than 7500 Btu/hr (8 MJ/hr) input if used with cylinders having a maximum water capacity of 2.7 lb (1.2 kg) and filled with no more than 16.8 oz (0.522 kg) of LP-Gas. (58:3-4.2.8)

21-3.3.2 Buildings Under Construction or Undergoing Major Renovation.

21-3.3.2.1 Cylinders shall be permitted to be used and transported in buildings or structures under construction or undergoing major renovation where such buildings are not occupied by the public or, if partially occupied by the public, cylinders shall be permitted to be used and transported in the unoccupied portions with the prior approval of the authority having jurisdiction. Such use shall be in accordance with 21-3.3.2.2 through 21-3.3.2.8. (58:3-4.3.1)

21-3.3.2.2 Cylinders, equipment, piping, and appliances shall comply with 3-4.2 of NFPA 58. (58:3-4.3.2)

21-3.3.2.3 For temporary heating, such as curing concrete, drying plaster, and similar applications, heaters (other than integral heater-container units covered in 21-3.3.2.4) shall be located at least 6 ft (1.8 m) from any cylinder. (58:3-4.3.3)

21-3.3.2.4 Integral heater-cylinder units specifically designed for the attachment of the heater to the cylinder, or to a supporting standard attached to the cylinder, shall be permitted to be used, provided they are designed and installed so as to prevent direct or radiant heat application to the cylinder. Blower-type and radiant-type units shall not be directed toward any cylinder within 20 ft (6.1 m). (58:3-4.3.4)

21-3.3.2.5 If two or more heater-cylinder units of either the integral or nonintegral type are located in an unpartitioned area on the same floor, the cylinder(s) of each such unit shall be separated from the cylinder (s) of any other such unit by at least 20 ft (6.1 m). (58:3-4.3.5)

21-3.3.2.6 If heaters are connected to cylinders manifolded together for use in an unpartitioned area on the same floor, the total water capacity of cylinders manifolded together serving any one heater shall not be greater than 735 lb (333 kg) [nominal 300 lb (136 kg) LP-Gas capacity] and, if there is more than one such manifold, it shall be separated from any other by at least 20 ft (6.1 m). (58:3-4.3.6)

21-3.3.2.7 On floors on which no heaters are connected for use, cylinders shall be permitted to be manifolded together for connection to a heater or heaters on another floor, provided the following:

- (1) The total water capacity of the cylinders connected to any one manifold is not greater than 2450 lb (1111 kg) [nominal 1000 lb (454 kg) LP-Gas capacity], and
- (2) Manifolds of more than 735 lb (333 kg) water capacity [nominal 300 lb (136 kg) LP-Gas capacity], if located in the same unpartitioned area, shall be separated from each other by at least 50 ft (15 m). (58:3-4.3.7)

21-3.3.2.8 The provisions of 21-3.3.2.5, 21-3.3.2.6, and 21-3.3.2.7 shall be permitted to be altered by the authority having jurisdiction if compliance is impractical. (58:3-4.3.8)

21-3.3.3 Buildings Undergoing Minor Renovation When Frequented by the Public. Cylinders shall be permitted to be used and transported for repair or minor renovation in buildings frequented by the public as follows:

- (1) During the hours the public normally occupies the building, the following shall apply:
 - a. The maximum water capacity of individual cylinders shall be 50 lb (23 kg) [nominal 20 lb (9.1 kg) LP-Gas capacity], and the number of cylinders in the building shall not exceed the number of workers assigned to the use of the LP-Gas.
 - b. Cylinders having a water capacity greater than 2.7 lb (1.2 kg) shall not be left unattended.
- (2) During the hours the building is not open to the public, cylinders shall be permitted to be used and transported within the building for repair or minor renovation in accordance with 3-4.2 and 3-4.3 of NFPA 58, provided that cylinders with a greater water capacity than 2.7 lb (1.2 kg) shall not be left unattended. (58:3-4.4)

21-3.3.4 Buildings Housing Industrial Occupancies.

21-3.3.4.1 Cylinders shall be permitted to be used in buildings housing industrial occupancies for processing, research, or experimental purposes as follows:

- (1) Cylinders, equipment, and piping used shall comply with 3-4.2 of NFPA 58.
- (2) If cylinders are manifolded together, the total water capacity of the connected cylinders shall be not more than 735 lb (333 kg) [nominal 300 lb (136 kg) LP-Gas capacity]. If there is more than one such manifold in a room, it shall be separated from any other by at least 20 ft (6.1 m).
- (3) The amount of LP-Gas in cylinders for research and experimental use in the building shall be limited to the smallest practical quantity. (58:3-4.5.1)

21-3.3.4.2 Cylinders shall be permitted to be used to supply fuel for temporary heating in buildings housing industrial occupancies with essentially noncombustible contents, if portable equipment for space heating is essential and a permanent heating installation is not practical, provided cylin-

ders and heaters comply with and are used in accordance with 21-3.3.2. (58:3-4.5.2)

21-3.3.5 Buildings Housing Educational and Institutional Occupancies. Cylinders shall be permitted to be used in buildings housing educational and institutional laboratory occupancies for research and experimental purposes, but not in classrooms, as follows:

- (1) The maximum water capacity of individual cylinders used shall be 50 lb (23 kg) [nominal 20 lb (9.1 kg) LP-Gas capacity] if used in educational occupancies and 12 lb (5.4 kg) [nominal 5 lb (2 kg) LP-Gas capacity] if used in institutional occupancies.
- (2) If more than one such cylinder is located in the same room, the cylinders shall be separated by at least 20 ft (6.1 m).
- (3) Cylinders not connected for use shall be stored in accordance with Section 21-5.

Exception: Cylinders shall not be stored in a laboratory room. (58:3-4.6)

21-3.3.6 Temporary Heating and Food Service Appliances in Buildings in Emergencies.

21-3.3.6.1 Cylinders shall be permitted to be used in buildings for temporary emergency heating purposes if necessary to prevent damage to the buildings or contents, and if the permanent heating system is temporarily out of service, provided the cylinders and heaters comply with and are used and transported in accordance with 3-4.2 and 3-4.3 of NFPA 58, and the temporary heating equipment is not left unattended. (58:3-4.7.1)

21-3.3.6.2 When a public emergency has been declared and gas, fuel, or electrical service has been interrupted, portable listed LP-Gas commercial food service appliances meeting the requirements of 21-3.3.7.4 shall be permitted to be temporarily used inside affected buildings. The portable appliances used shall be discontinued and removed from the building at the time the permanently installed appliances are placed back in operation. (58:3-4.7.2)

21-3.3.7 Use in Buildings for Demonstrations or Training, or Use in Small Containers.

21-3.3.7.1 Cylinders having a maximum water capacity of 12 lb (5.4 kg) [nominal 5 lb (2 kg) LP-Gas capacity] shall be permitted to be used temporarily inside buildings for public exhibitions or demonstrations, including use in classroom demonstrations. If more than one such cylinder is located in a room, the cylinders shall be separated by at least 20 ft (6.1 m). (58:3-4.8.1)

21-3.3.7.2 Cylinders shall be permitted to be used temporarily in buildings for training purposes related to the installation and use of LP-Gas systems, provided the following conditions are met:

- (1) The maximum water capacity of individual cylinders shall be 245 lb (111 kg) [nominal 100 lb (45 kg) LP-Gas capacity], but not more than 20 lb (9.1 kg) of LP-Gas shall be placed in a single cylinder.
- (2) If more than one such cylinder is located in the same room, the cylinders shall be separated by at least 20 ft (6.1 m).
- (3) The training location shall be acceptable to the authority having jurisdiction.
- (4) Cylinders shall be promptly removed from the building when the training class has terminated. (58:3-4.8.2)

21-3.3.7.3* Cylinders complying with UL 147A, *Standard for Nonrefillable (Disposable) Type Fuel Gas Cylinder Assemblies*, and having a maximum water capacity of 2.7 lb (1.2 kg) shall be permitted to be used in buildings as part of approved self-contained torch assemblies or similar appliances. (58:3-4.8.3)

21-3.3.7.4 Listed and approved LP-Gas commercial food service appliances shall be permitted to be used inside restaurants and in attended commercial food catering operations provided that no commercial food service appliances shall have more than two 10-oz (296-ml) nonrefillable butane gas containers complying with UL 147B, *Standard for Nonrefillable (Disposal) Type Metal Container Assemblies for Butane*, having a maximum water capacity of 1.08 lb (0.490 kg) per container connected directly to the appliance at any time and the containers shall not be manifolded. The appliance fuel container(s) shall be an integral part of the listed, approved, commercial food service device and shall be connected without the use of a rubber hose. Butane containers shall be listed. Storage of containers shall be in accordance with 5-3.1 of NFPA 58. (58:3-4.8.4)

21-3.3.8 Cylinders on Roofs or Exterior Balconies.

21-3.3.8.1 Cylinders shall be permitted to be permanently installed on roofs of buildings of fire-resistive construction, or noncombustible construction having essentially noncombustible contents, or of other construction or contents that are protected with automatic sprinklers (*see NFPA 220, Standard on Types of Building Construction*) in accordance with 3-4.2 of NFPA 58 and the following:

(a) The total water capacity of cylinders connected to any one manifold shall be not greater than 980 lb (445 kg) [nominal 400 lb (181 kg) LP-Gas capacity]. If more than one manifold is located on the roof, it shall be separated from any other by at least 50 ft (15 m).

(b) Cylinders shall be located in areas where there is free air circulation, at least 10 ft (3.0 m) from building openings (such as windows and doors), and at least 20 ft (6.1 m) from air intakes of air conditioning and ventilating systems.

(c) Cylinders shall not be located on roofs that are entirely enclosed by parapets more than 18 in. (457 mm) high unless the parapets are breached with low-level ventilation openings no more than 20 ft (6.1 m) apart or all openings communicating with the interior of the building are at or above the top of the parapets.

(d) Piping shall be in accordance with 3-4.2.3 of NFPA 58. Hose shall not be used for connection to cylinders.

(e) The fire department shall be advised of each such installation. (58:3-4.9.1)

21-3.4 Fire Protection.

21-3.4.1 General.

21-3.4.1.1 The wide range in size, arrangement, and location of LP-Gas installations covered by NFPA 58 precludes the inclusion of detailed fire protection provisions completely applicable to all installations. Provisions in 21-3.4 are subject to verification or modification through analysis of local conditions. (58:3-10.2.1)

21-3.4.1.2* The planning for effective measures for control of inadvertent LP-Gas release or fire shall be coordinated with local emergency handling agencies such as fire and police departments. Such measures require specialized knowledge and training not commonly present in the training programs

of emergency handling agencies. Planning shall consider the safety of emergency personnel. (58:3-10.2.2)

21-3.4.1.3* Fire protection shall be provided for installations having storage containers with an aggregate water capacity of more than 4000 gal (15.1 m³) subject to exposure from a single fire. The mode of such protection shall be determined through a competent fire safety analysis. The first consideration in any such analysis shall be an evaluation of the total product control system including emergency shutoff and internal valves having remote and thermal shutoff capability and pullaway protection, and the optional requirements of Section 3-11 of NFPA 58, if used.

Exception No. 1: If the analysis specified in 21-3.4.1.3 indicates a serious hazard does not exist, the fire protection provisions of 21-3.4.1.3 shall not apply.

Exception No. 2: If the analysis specified in 21-3.4.1.3 indicates that a serious hazard exists and the provisions of 21-3.4.1.3 cannot be met, special protection shall be provided in accordance with 21-3.4.2. (58:3-10.2.3)

21-3.4.1.4 Suitable roadways or other means of access for emergency equipment, such as fire department apparatus, shall be provided. (58:3-10.2.4)

21-3.4.1.5 Each industrial plant, bulk plant, and distributing point shall be provided with at least one approved portable fire extinguisher having a minimum capacity of 18 lb (8.2 kg) of dry chemical with a B:C rating. (See also NFPA 10, *Standard for Portable Fire Extinguishers*.) (58:3-10.2.5)

21-3.4.1.6 LP-Gas fires shall not normally be extinguished until the source of the burning gas has been shut off or can be shut off. (58:3-10.2.6)

21-3.4.1.7 Emergency controls shall be conspicuously marked, and the controls shall be located so as to be readily accessible in emergencies. (58:3-10.2.7)

21-3.4.2 Special Protection.

21-3.4.2.1* If insulation is used, it shall be capable of limiting the container temperature to not over 800°F (427°C) for a minimum of 50 minutes as determined by test with insulation applied to a steel plate and subjected to a test flame substantially over the area of the test plate. The insulation system shall be inherently resistant to weathering and the action of hose streams. (See Appendix H of NFPA 58.) (58:3-10.3.1)

21-3.4.2.2 If mounding is utilized, the provisions of 3-2.4.7 of NFPA 58 shall be required. (58:3-10.3.2)

21-3.4.2.3 If burial is utilized, the provisions of 3-2.4.8 of NFPA 58 shall be required. (58:3-10.3.3)

21-3.4.2.4 If water spray fixed systems are used, they shall comply with NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*. Such systems shall be automatically actuated by fire responsive devices and shall also have a capability for manual actuation. (58:3-10.3.4)

21-3.4.2.5 If monitor nozzles are used, they shall be located and arranged so that all container surfaces likely to be exposed to fire will be wetted. Such systems shall otherwise comply with NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, and shall be automatically actuated by fire responsive devices and shall also have a capability for manual actuation. (58:3-10.3.5)

21-4 LP-Gas Liquid Transfer.

21-4.1 Application. This section covers the transfer of liquid LP-Gas from one container to another wherever this transfer involves connections and disconnections in the transfer system, or the venting of LP-Gas to the atmosphere. Included are provisions covering operational safety and methods for determining the quantity of LP-Gas permitted in containers. (58:4-1.1.1)

21-4.2 Operational Safety.

21-4.2.1 Transfer Personnel.

21-4.2.1.1 Transfer operations shall be conducted by qualified personnel meeting the provisions of Section 1-5 of NFPA 58. At least one qualified person shall remain in attendance at the transfer operation from the time connections are made until the transfer is completed, shutoff valves are closed, and lines are disconnected. (58:4-2.1.1)

21-4.2.1.2 Transfer personnel shall exercise precaution to ensure that the LP-Gases transferred are those for which the transfer system and the containers to be filled are designed. (58:4-2.1.2)

21-4.2.2 Containers to Be Filled or Evacuated.

21-4.2.2.1 In the interest of safety, transfer of LP-Gas to and from a container shall be accomplished only by qualified persons trained in proper handling and operating procedures meeting the requirements of Section 1-5 of NFPA 58 and in emergency response procedures. Such persons shall notify the container owner and user in writing when noncompliance with Sections 2-2 and 2-3 of NFPA 58 is found. (58:4-2.2.1)

21-4.2.2.2 Injection of compressed air, oxygen, or any oxidizing gas into containers to transfer LP-Gas liquid shall not be permitted.

When evacuating a container owned by others, the qualified person(s) performing the transfer shall not inject any material other than LP-Gas into the container. (58:4-2.2.2)

21-4.2.2.3 Valve outlets on cylinders of 108 lb (49 kg) water capacity [nominal 45 lb (20 kg) propane capacity] or less shall be equipped with an effective seal such as a plug, cap, listed quick-closing coupling, or a listed quick-connect coupling. This seal shall be in place whenever the cylinder is not connected for use.

Exception: Nonrefillable (disposable) and new unused cylinders shall not be required to comply. (58:4-2.2.3)

21-4.2.2.4 Containers shall be filled only after determination that they comply with the design, fabrication, inspection, marking, and requalification provisions of NFPA 58. (See 2-2.1.3 through 2-2.1.6 of NFPA 58.) (58:4-2.2.4)

21-4.2.2.5 Cylinders authorized as "single trip," "nonrefillable," or "disposable" cylinders shall not be refilled with LP-Gas. (58:4-2.2.5)

21-4.3 Arrangement and Operation of Transfer Systems.

21-4.3.1 Public access to areas where LP-Gas is stored and transferred shall be prohibited except where necessary for the conduct of normal business activities. (58:4-2.3.1)

21-4.3.2 Sources of ignition shall be controlled during transfer operations, while connections or disconnections are made, or while LP-Gas is being vented to the atmosphere.

(a) Internal combustion engines within 15 ft (4.6 m) of a point of transfer shall be shut down while such transfer operations are in progress, except as follows:

- (1) Engines of LP-Gas cargo vehicles constructed and operated in compliance with Chapter 6 while such engines are driving transfer pumps or compressors on these vehicles to load containers as provided in 3-2.3.2 of NFPA 58
- (2) Engines installed in buildings as provided in Section 8-3 of NFPA 58

(b) Smoking, open flame, metal cutting or welding, portable electrical tools, and extension lights capable of igniting LP-Gas shall not be permitted within 25 ft (7.6 m) of a point of transfer while filling operations are in progress. Care shall be taken to ensure that materials that have been heated have cooled before that transfer is started.

(c) Sources of ignition, such as pilot lights, electric ignition devices, burners, electrical appliances, and engines located on the vehicle being refueled shall be turned off during the filling of any LP-Gas container on the vehicle. (58:4-2.3.2)

21-4.3.3 Cargo vehicles (*see Section 6-3 of NFPA 58*) unloading into storage containers shall be at least 10 ft (3.0 m) from the container and so positioned that the shutoff valves on both the truck and the container are readily accessible. The cargo vehicle shall not transfer LP-Gas into dispensing station storage while parked on a public way. (58:4-2.3.3)

21-4.4 Venting LP-Gas to the Atmosphere. LP-Gas, in either liquid or vapor form, shall not be vented to the atmosphere.

Exception No. 1: Venting for the operation of fixed liquid level, rotary or slip tube gauges, provided the maximum flow does not exceed that from a No. 54 drill orifice.

Exception No. 2: Venting of LP-Gas between shutoff valves before disconnecting the liquid transfer line from the container. Where necessary, suitable bleeder valves shall be used.

Exception No. 3: LP-Gas shall be permitted to be vented for the purposes described in Exceptions No. 1 and 2 within structures designed for container filling as provided in 3-2.3.1 and Chapter 7 of NFPA 58.

Exception No. 4: Venting vapor from listed liquid transfer pumps using such vapor as a source of energy, provided the rate of discharge does not exceed that from a No. 31 drill size orifice. (See 3-2.3.3 of NFPA 58 for location of such transfer operations.)

Exception No. 5: Purging as permitted in 4-3.2 of NFPA 58.

Exception No. 6: Emergency venting as permitted in 4-3.3 of NFPA 58. (58:4-3.1)

21-5 Storage of Portable Containers Awaiting Use or Resale.

21-5.1 Application.

21-5.1.1 The provisions of this chapter are applicable to the storage of cylinders of 1000 lb (454 kg) water capacity, or less, whether filled, partially filled, or empty (if they have been in LP-Gas service) as follows:

- (1) At consumer sites or dispensing stations, where not connected for use
- (2) In storage for resale or exchange by dealer or reseller (58:5-1.1.1)

21-5.1.2 The provisions of this section shall not apply to cylinders stored at bulk plants. (58:5-1.1.2)

21-5.2 General Location of Cylinders.

21-5.2.1 Cylinders in storage shall be located to minimize exposure to excessive temperature rise, physical damage, or tampering. (58:5-2.1.1)

21-5.2.2 Cylinders in storage having individual water capacity greater than 2½ lb (1.1 kg) [nominal 1 lb (0.45 kg)] LP-Gas capacity shall be positioned such that the pressure relief valve is in direct communication with the vapor space of the cylinder. (58:5-2.1.2)

21-5.2.3 Cylinders stored in buildings in accordance with 21-5.4 shall not be located near exits, stairways, or in areas normally used, or intended to be used, for the safe egress of occupants. (58:5-2.1.3)

21-5.2.4 If empty cylinders that have been in LP-Gas service are stored indoors, they shall be considered as full cylinders for the purposes of determining the maximum quantities of LP-Gas permitted in 21-5.4.1, 21-5.4.2.1, and 21-5.4.3.1. (58:5-2.1.4)

21-5.2.5 Cylinders that are not connected for use shall not be stored on roofs. (58:5-2.1.5)

21-5.3 Protection of Valves on Cylinders in Storage. Cylinder valves shall be protected as required by 21-2.1.6. Screw-on type caps or collars shall be securely in place on all cylinders stored, regardless of whether they are full, partially full, or empty, and cylinder outlet valves shall be closed and plugged or capped. The provisions of 21-4.2.2.3 for valve outlet plugs and caps shall apply. (58:5-2.2.1)

21-5.4 Storage within Buildings.

21-5.4.1 Storage within Buildings Frequented by the Public. Cylinders with a maximum water capacity of 2½ lb (1.1 kg) [nominal 1 lb (0.45 kg)] LP-Gas capacity used with completely self-contained hand torches and similar applications, shall be permitted to be stored or displayed in a building frequented by the public. The quantity of LP-Gas shall not exceed 200 lb (91 kg).

Exception No. 1: Storage in restaurants and at food service locations of 10-oz (283-g) butane nonrefillable containers shall be limited to no more than 24 containers.

Exception No. 2: An additional twenty-four 10-oz (283-g) butane nonrefillable containers shall be permitted to be stored in another location within the building provided that the storage area is constructed with at least a 2-hour fire wall protection. (58:5-3.1)

21-5.4.2 Storage within Buildings Not Frequented by the Public (Such as Industrial Buildings).

21-5.4.2.1 The maximum quantity allowed in one storage location shall not exceed 735 lb (334 kg) water capacity [nominal 300 lb (136 kg) LP-Gas]. If additional storage locations are required on the same floor within the same building, they shall be separated by a minimum of 300 ft (91.4 m). Storage beyond these limitations shall comply with 21-5.4.3. (58:5-3.2.1)

21-5.4.2.2 Cylinders carried as part of the service equipment on highway mobile vehicles shall not be considered part of the total storage capacity in the requirements of 21-5.4.2.1 provided such vehicles are stored in private garages and carry no more than three cylinders with a total aggregate capacity per vehicle not exceeding 100 lb (45.4 kg) of LP-Gas. Cylinder valves shall be closed when not in use. (58:5-3.2.2)

21-5.4.3 Storage within Special Buildings or Rooms.

21-5.4.3.1 The maximum quantity of LP-Gas stored in special buildings or rooms shall be 10,000 lb (4540 kg). (58:5-3.3.1)

21-5.4.3.2 Special buildings or rooms for storing LP-Gas cylinders shall not be located adjoining the line of property occupied by schools, churches, hospitals, athletic fields, or other points of public gathering. (58:5-3.3.2)

21-5.4.3.3 The construction of all such special buildings, and rooms within, or attached to, other buildings, shall comply with Chapter 7 of NFPA 58 and the following:

- (1) Adequate vents, to the outside only, shall be provided at both top and bottom and shall be located at least 5 ft (1.5 m) from any building opening.
- (2) The entire area shall be classified for purposes of ignition source control in accordance with Section 3-7 of NFPA 58. (58:5-3.3.3)

21-5.4.4 Storage within Residential Buildings. Storage of cylinders within a residential building, including the basement or any storage area in a common basement storage area in multiple family buildings and attached garages, shall be limited to two cylinders each with a maximum water capacity of 2.7 lb (1.2 kg) and shall not exceed 5.4 lb (2.4 kg) total water capacity for smaller cylinders per each living space unit. Each cylinder shall meet DOT specifications. (58:5-3.4)

21-5.5 Storage Outside of Buildings.

21-5.5.1* Location of Storage Outside of Buildings. Storage outside of buildings for cylinders awaiting use, resale, or part of a cylinder exchange point shall be located at least 20 ft (6.1 m) from any doorway or opening in a building frequented by the public; 20 ft (6.1 m) from any automotive service station fuel dispenser; and in accordance with Table 21-5.5.1 with respect to:

- (1) Nearest important building or group of buildings
- (2) Line of adjoining property that can be built upon
- (3) Busy thoroughfares or sidewalks
- (4) Line of adjoining property occupied by schools, churches, hospitals, athletic fields, or other points of public gathering
- (5) Dispensing station

Exception: Cylinders in the filling process shall not be considered to be in storage. (58:5-4.1)

Table 21-5.5.1

| Quantity of LP-Gas Stored lb (kg) | Horizontal Distance in ft (m) to | | |
|--------------------------------------|----------------------------------|-------------|----------|
| | (1) and (2) | (3) and (4) | (5) |
| 720 (227) or less | 0 | 0 | 5 (1.5) |
| 721 to 2,500 lb (227+ to 1134) | 0 | 10 (3) | 10 (3) |
| 2501 to 6000 (1134+ to 2721) | 10 (3) | 10 (3) | 10 (3) |
| 6001 to 10,000 (2721+ to 4540) | 20 (6.1) | 20 (6.1) | 20 (6.1) |
| Over 10,000 (4540) | 25 (7.6) | 25 (7.6) | 25 (7.6) |

(58:Table 5-4.1)

21-5.5.2 Protection of Cylinders.

21-5.5.2.1 Cylinders at a location open to the public shall be protected by either:

- (1) An enclosure in accordance with 21-3.2.1 (1), or
- (2) A lockable ventilated metal locker or rack that prevents tampering with valves and pilferage of the cylinder. (58:5-4.2.1)

21-5.5.2.2 Protection against vehicle impact shall be provided in accordance with good engineering practice where vehicle traffic normally is expected at the location. (58:5-4.2.2)

21-5.5.3 Alternate Location and Protection of Storage. Where the provisions of 21-5.5.1 and 21-5.5.2.1 are impractical at construction sites, or at buildings or structures undergoing major renovation or repairs, the storage of cylinders shall be acceptable to the authority having jurisdiction. (58:5-4.3)

21-5.6 Fire Protection. Storage locations, other than supply depots at separate locations apart from those of the dealer, reseller, or user's establishments, shall be provided with at least one approved portable fire extinguisher having a minimum capacity of 18 lb (8.2 kg) dry chemical with a B:C rating. (Also see NFPA 10, *Standard for Portable Fire Extinguishers*.) (58:5-5)

21-6 Vehicular Transportation of LP-Gas.**21-6.1 Transportation in Portable Containers.****21-6.1.1 Transportation of Cylinders.**

21-6.1.1.1 Portable containers having an individual water capacity not exceeding 1,000 lb (454 kg) [nominal 420 lb (191 kg) LP-Gas capacity], when filled with LP-Gas, shall be transported in accordance with 21-6.1.1.2 through 21-6.1.1.8. (58:6-2.2.1)

21-6.1.1.2 Cylinders shall be constructed as provided in Section 2-2 of NFPA 58 and equipped in accordance with Section 2-3 of NFPA 58 for transportation as cylinders. (58:6-2.2.2)

21-6.1.1.3 The quantity of LP-Gas in containers shall be in accordance with Chapter 4 of NFPA 58. (58:6-2.2.3)

21-6.1.1.4 Valves of cylinders shall be protected in accordance with 21-2.1.6. Screw-on type protecting caps or collars shall be secured in place. The provisions of 21-4.2.2.3 shall apply. (58:6-2.2.4)

21-6.1.1.5 The cargo space of the vehicle shall be isolated from the driver's compartment, the engine, and its exhaust system. Open-bodied vehicles shall be considered to be in compliance with this provision. Closed-bodied vehicles having separate cargo, driver's, and engine compartments shall also be considered to be in compliance with this provision.

Exception: Closed-bodied vehicles such as passenger cars, vans, and station wagons shall not be used for transporting more than 215 lb (98 kg) water capacity [nominal 90 lb (41 kg) LP-Gas capacity] but not more than 108 lb (49 kg) water capacity [nominal 45 lb (20 kg) LP-Gas capacity] per cylinder (see 21-6.1.1.6 and 21-6.1.1.7) unless the driver's and engine compartments are separated from the cargo space by a vaportight partition that contains no means of access to the cargo space. (58:6-2.2.5)

21-6.1.1.6 Cylinders and their appurtenances shall be determined to be leak-free before being loaded into vehicles. Cylinders shall be loaded into vehicles with substantially flat floors or equipped with suitable racks for holding cylinders. Cylinders

ders shall be securely fastened in position to minimize the possibility of movement, tipping, or physical damage. (58:6-2.2.6)

21-6.1.1.7 Cylinders having an individual water capacity not exceeding 108 lb (49 kg) [nominal 45 lb (20 kg) LP-Gas capacity] transported in open vehicles and cylinders having an individual water capacity not exceeding 10 lb (4.5 kg) [nominal 4.2 lb (2 kg) LP-Gas capacity] transported in enclosed spaces of the vehicle shall be permitted to be transported in other than the upright position. Cylinders having an individual water capacity exceeding 108 lb (49 kg) [nominal 45 lb (20 kg) LP-Gas capacity] transported in open vehicles and cylinders having an individual water capacity exceeding 10 lb (4.5 kg) [nominal 4.2 lb (1.9 kg) LP-Gas capacity] transported in enclosed spaces shall be transported with the relief device in direct communication with the vapor space. (58:6-2.2.7)

21-6.1.1.8 Vehicles transporting more than 1,000 lb (454 kg) of LP-Gas, including the weight of the cylinders, shall be placarded as required by DOT regulations or state law. (58:6-2.2.8)

21-6.1.2 Fire Extinguishers. Each truck or trailer transporting portable containers as provided by 21-6.1.1 of this Code or 6-2.3 of NFPA 58 shall be equipped with at least one approved portable fire extinguisher having a minimum capacity of 18 lb (8.2 kg) dry chemical with a B:C rating. (Also see NFPA 10, *Standard for Portable Fire Extinguishers*.) (58:6-2.4)

21-6.2 Parking and Garaging Vehicles Used to Carry LP-Gas Cargo.

21-6.2.1 Application. This section applies to the parking (except parking associated with a liquid transfer operation) and garaging of vehicles used for the transportation of LP-Gas. Such vehicles include those used to carry portable containers (see Section 6-2 of NFPA 58) and those used to carry LP-Gas in cargo tanks (see Section 6-3 of NFPA 58). (58:6-6.1)

21-6.2.2 Parking of Vehicles.

21-6.2.2.1 Vehicles carrying or containing LP-Gas parked outdoors shall comply with the following.

(a) Vehicles shall not be left unattended on any street, highway, avenue, or alley, provided that drivers are not prevented from those necessary absences from the vehicle connected with their normal duties, nor shall this requirement prevent stops for meals or rest stops during the day or night.

Exception No. 1: This shall not apply in an emergency.

Exception No. 2: This shall not apply to vehicles parked in accordance with 21-6.2.2.1(b).

(b) Vehicles shall not be parked in congested areas. Such vehicles shall be permitted to be parked off the street in uncongested areas if at least 50 ft (15 m) from any building used for assembly, institutional, or multiple residential occupancy. This requirement shall not prohibit the parking of vehicles carrying portable containers or cargo vehicles of 3500 gal (13 m³) water capacity or less on streets adjacent to the driver's residence in uncongested residential areas, provided such parking locations are at least 50 ft (15 m) from a building used for assembly, institutional, or multiple residential occupancy. (58:6-6.2.1)

21-6.2.2.2 Vehicles parked indoors shall comply with the following.

(a) Cargo vehicles parked in any public garage or building shall have LP-Gas liquid removed from the cargo container,

pipings, pump, meter, hoses, and related equipment, and the pressure in the delivery hose and related equipment shall be reduced to approximately atmospheric, and all valves shall be closed before the vehicle is moved indoors. Delivery hose or valve outlets shall be plugged or capped before the vehicle is moved indoors.

(b) Vehicles used to carry portable containers shall not be moved into any public garage or building for parking until all portable containers have been removed from the vehicle.

(c) Vehicles carrying or containing LP-Gas shall be permitted to be parked in buildings complying with Chapter 7 of NFPA 58 and located on premises owned or under the control of the operator of such vehicles, provided the following occurs:

- (1) The public is excluded from such buildings.
- (2) There is floor level ventilation in all parts of the building where such vehicles are parked.
- (3) Leaks in the vehicle LP-Gas systems are repaired before the vehicle is moved indoors.
- (4) Primary shutoff valves on cargo tanks and other LP-Gas containers on the vehicle (except propulsion engine fuel containers) are closed and delivery hose outlets are plugged or capped to contain system pressure before the vehicle is moved indoors. Primary shutoff valves on LP-Gas propulsion engine fuel containers shall be closed while the vehicle is parked.
- (5) No LP-Gas container is located near a source of heat or within the direct path of hot air being blown from a blower-type heater.
- (6) LP-Gas containers are gauged or weighed to determine that they are not filled beyond the maximum filling limit according to Section 4-4 of NFPA 58. (58:6-6.2.2)

21-6.2.2.3 Vehicles shall be permitted to be serviced or repaired indoors as follows.

(a) When it is necessary to move a vehicle into any building located on premises owned or operated by the operator of such vehicle for service on engine or chassis, the provisions of 21-6.2.2.2(1) or (3) shall apply.

(b) When it is necessary to move a vehicle carrying or containing LP-Gas into any public garage or repair facility for service on the engine or chassis, the provisions of 21-6.2.2.2(1) or (2) shall apply, unless the driver or a qualified representative of an LP-Gas operator is in attendance at all times while the vehicle is indoors. In this case, the following provisions shall apply under the supervision of such qualified persons:

- (1) Leaks in the vehicle LP-Gas systems shall be repaired before the vehicle is moved indoors.
- (2) Primary shutoff valves on cargo tanks, portable containers, and other LP-Gas containers installed on the vehicle (except propulsion engine fuel containers) shall be closed. LP-Gas liquid shall be removed from the piping, pump, meter, delivery hose, and related equipment and the pressure therein reduced to approximately atmospheric before the vehicle is moved inside. Delivery hose or valve outlets shall be plugged or capped before the vehicle is moved indoors.
- (3) No container shall be located near a source of heat or within the direct path of hot air blown from a blower or from a blower-type heater.
- (4) LP-Gas containers shall be gauged or weighed to determine that they are not filled beyond the maximum filling capacity according to Section 4-4 of NFPA 58.

(c) If repair work or servicing is to be performed on a cargo tank system, all LP-Gas shall be removed from the cargo tank and piping, and the system shall be thoroughly purged before the vehicle is moved indoors. (58:6-6.2.3)

21-7 LP-Gases at Utility Plants. The design, construction, location, installation, and operation of refrigerated and nonrefrigerated liquefied petroleum gas systems at utility gas plants shall be in accordance with NFPA 59, *Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants*.

21-8 Liquefied Natural Gas (LNG). The design, location, construction, and operation of liquified natural gas facilities shall be in accordance with NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*.

Chapter 22 Marinas, Boatyards, Marine Terminals, Piers, and Wharves

22-1 Marinas and Boatyards.

22-1.1* The construction and operation of marinas, boatyards, yacht clubs, boat condominiums, docking facilities associated with residential condominiums, multiple-docking facilities at multiple-family residences, and all associated piers, docks, and floats shall comply with this section and NFPA 303, *Fire Protection Standard for Marinas and Boatyards*.

22-1.2 This section shall apply to support facilities and structures used for construction, repair, storage, hauling and launching, or fueling of vessels if fire on a dock would pose an immediate threat to these facilities, or a fire at a referenced facility would pose an immediate threat to a dock area. (303:1-1.1)

22-1.3 This section shall apply to marinas and facilities:

- (1) Servicing small recreational and commercial craft, yachts, and other craft of not more than 300 gross tons, and
- (2) Not covered by NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*, or NFPA 30A, *Automotive and Marine Service Station Code*. (303:1-1.2)

22-1.4 Single family residences with docking facilities for private, non-commercial use are not intended to be covered by this section, but use of the requirements of NFPA 303 by the authority having jurisdiction for single-family residences shall be permitted.

22-1.5 No requirement in this section shall be construed as reducing applicable building, fire, and electrical codes. (303:1-1.3)

22-2 Marine Terminals, Piers, and Wharves.

22-2.1 Marine terminals, piers, and wharves shall comply with this section and NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*.

22-2.2 The general principles of this section for the construction and fire protection of piers and wharves shall be applicable to special use piers and wharf structures that are not marine terminals, but which require special consideration. These special use structures shall include public assembly, residential, business, or recreational occupancies that differ in design and construction from cargo handling piers.

22-2.3 This section shall not apply to the following:

- (1) *Marinas and boatyards (307:1-1.2)
- (2) *Handling of flammable or combustible liquids in bulk (307:1-1.3)
- (3) *Handling of liquefied gases in bulk (307:1-1.4)

22-3 Construction, Repair, and Lay-Up of Vessels.

22-3.1* The construction, conversion, repair or lay-up of vessels shall comply with this section and NFPA 312, *Standard for Fire Protection of Vessels During Construction, Repair, and Lay-up*.

22-3.2 Emergency Exception. Nothing in this document shall be construed as prohibiting the immediate dry-docking of a vessel whose safety is imperiled, as by being in a sinking condition or by being seriously damaged. In such cases, all necessary precautionary measures shall be taken as soon as practicable. (312:1-1.1)

22-3.3 The requirements of this section shall not apply to situations where they are in conflict with or are superseded by requirements of any government regulatory agency. (312:1-1)

Chapter 23 Mechanical Refrigeration

23-1 General. This chapter shall apply to all refrigerating units or systems described herein.

Exception: Air, water, or brine systems and all units using Group 1 refrigerants with a refrigerant compressor or horsepower rating of less than 100.

23-2 Classifications.

23-2.1 Group 1 refrigerants shall include

- Carbon dioxide (R-744)
- Chlorodifluoromethane (R-22)
- Dichlorodifluoromethane (R-12) (R-500)
- Dichlorofluoromethane (R-21)
- Dichlorotetrafluoroethane (R-114)
- Trichlorofluoromethane (R-11)
- Dichloromethane (methylene chloride) (R-30)
- Trifluorotrichloroethane (R-113)
- Chlorotrifluoromethane (R-13)
- Bromotrifluoromethane (R-13 B1)
- Carbontetrafluoride (R-14)
- Chlorodifluoromethane (R-22) (R-502)
- Chloropentafluoroethane (R-115)
- Octafluorocyclobutane (R-C318)

23-2.2 Group 2 refrigerants shall include

- Ammonia (R-717)
- Dichloroethylene (R-1130)
- Methyl chloride (R-40)
- Methyl formate (R-611)
- Sulfur dioxide (R-764)

23-2.3 Group 3 refrigerants shall include

- Butane (R-600)
- Ethane (R-170)

Propane (R-290)

Ethylene (R-1150)

Isobutane (R-600a)

23-3 Maintenance and Installation.

23-3.1 All refrigeration systems shall be maintained free from accumulations of oil, dirt, waste, and other debris and shall be maintained accessible at all times.

23-3.2 All new mechanical refrigeration systems shall be installed and all existing installations shall be maintained in a standard safe manner that minimizes life, health, and fire hazards of the installation.

23-3.3 The person in charge of a premises where a refrigeration unit requiring a permit is installed shall place a card in a conspicuous location near the condensing unit giving instructions for operation of the system, including precautions to be observed in case of breakdown or leak.

23-3.4 All refrigeration systems requiring a permit shall be provided with a legible sign (i.e., manufacturer's nameplate) that is permanently attached and easily accessible, indicating the following:

- (1) Name and address of the manufacturer or installer
- (2) Kind and total number of pounds of refrigerant contained in the system
- (3) Field test pressure applied

23-3.5 All systems containing more than 100 lb (45 kg) of refrigerant shall be provided with signs having letters not less than $\frac{1}{2}$ in. (12.7 mm) high designating the following:

- (1) Main shutoff valves to each vessel
- (2) Main stream or electrical control
- (3) Remote control switch
- (4) Pressure limiting device

23-4* Emergency Discharge of Ammonia Refrigerant. Ammonia refrigeration systems shall be provided with an approved system for safely removing the ammonia refrigerant in the event of an emergency.

Chapter 24 Oxidizers and Organic Peroxides

24-1 General.

24-1.1 This chapter shall apply to the prevention, control, and mitigation of dangerous conditions related to the storage of solid and liquid oxidizers and organic peroxide formulations. (See Appendix B for the classification of hazard categories and hazard evaluations.)

24-1.2 Permits. Permits, where required, shall comply with Section 1-16.

24-1.3 A plan to close a facility or terminate storage, dispensing, handling, or use of hazardous materials shall be submitted for approval at least 30 days prior to the action. The plan shall demonstrate that hazardous materials that were stored, dispensed, handled, or used in the facility have been transported, disposed of, or reused in a manner that eliminates the need for further maintenance and any threat to public health and safety.

24-2 Liquid and Solid Oxidizers.

24-2.1 Application.

24-2.1.1 The storage of oxidizers that are liquid or solid at ambient conditions shall be in accordance with this section and NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers*.

24-2.1.2 This section shall not apply to the storage of solid and liquid oxidizers for normal use on the premises of single-family dwellings. (430:1-1.1)

24-2.1.3 This section shall not apply to explosives or blasting agents, which are covered by Section 16-8 and NFPA 495, *Explosive Materials Code*; to ammonium nitrate, which is covered in Section 16-9 and NFPA 490, *Code for the Storage of Ammonium Nitrate*; or to organic peroxides, which are covered in Section 24-3 and NFPA 432, *Code for the Storage of Organic Peroxide Formulations*. (430:1-1.2)

24-2.1.4 The quantity and arrangement limits in this section and NFPA 430 shall not apply to the storage of oxidizers at plants where oxidizers are manufactured. (430:1-1.3)

24-2.1.5 Existing buildings that do not comply with the requirements of this section or NFPA 430 pertaining to types of construction, separation of buildings, and fixed fire protection shall be used for storing oxidizers at the discretion of the authority having jurisdiction, provided that the buildings do not constitute a distinct hazard to life or adjoining property. (430:1-1.1.3)

24-2.2 Classification of Oxidizers. For the purpose of this section and NFPA 430, oxidizers shall be classified according to the system listed in (a) through (d) of 24-2.2. The classification is based on the NFPA's Technical Committee on Hazardous Chemicals' evaluation of available scientific and technical data, actual experience, and its considered opinion. Gross contamination can cause oxidizers of all classes to undergo exothermic or explosive reaction, particularly if they also are subjected to confinement and heating. (See Chapter 2 for definition of Oxidizer. See sections B-2.1 through B-2.4 for oxidizer classification.)

(a) *Class 1.* An oxidizer that meets the definition of an oxidizer in Chapter 2 and does not moderately increase the burning rate of combustible materials with which it comes into contact.

(b) *Class 2.* An oxidizer that will cause a moderate increase in the burning rate of combustible materials with which it comes into contact.

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

(d) **Class 4.* An oxidizer than can undergo an explosive reaction due to contamination or exposure to thermal or physical shock. In addition, the oxidizer will cause a severe increase in the burning rate of combustible materials with which it comes into contact. (430:1-6)

24-2.3 Quantities.

24-2.3.1 Where the quantities of oxidizers stored are in excess of those stated in Table 24-2.3.1, the specific requirements for storage of oxidizers by class in 24-2.7 through 24-2.10 and separate chapters of NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers*, shall apply. In addition, all of Chapter 2 of NFPA 430 shall apply.

Table 24-2.3.1 Quantities of Stored Oxidizers that Require Special Provisions

| Class of Oxidizer | Quantity Stored | |
|-------------------|-----------------|------|
| | lb | kg |
| Class 1 | 4000 | 1814 |
| Class 2 | 1000 | 454 |
| Class 3 | 200 | 91 |
| Class 4 | 10 | 4.5 |

24-2.3.2 Where the quantities of a class of oxidizers are equal to or less than the minimum specified in Table 24-2.3.1, those parts of this section and NFPA 430 pertaining to fire prevention and sprinkler protection and compatibility for that class of oxidizer shall be used as requirements. In addition, all of Chapter 2 of NFPA 430 shall apply.

24-2.4 General Storage Arrangements.

24-2.4.1 The arrangement and quantity of oxidizers in storage shall depend upon their classification, type of container, type of storage (segregated, cutoff, or detached), and fire protection as specified in the succeeding section and in the manufacturer's or processor's instructions. The arrangement and quantity of oxidizers in storage shall be permitted to deviate from the requirements of NFPA 430 where specially engineered fire prevention or fire protection systems acceptable to the authority having jurisdiction are provided. (430: 2-4.1)

24-2.4.2 Oxidizers shall be stored to avoid contact with incompatible materials such as ordinary combustibles, combustible or flammable liquids, greases, and those materials that have the potential to react with the oxidizer or promote or initiate its decomposition. These incompatible materials shall not include approved packaging materials, pallets, or other dunnage.

Exception: Hydrogen peroxide (Classes 2 through 4) stored in drums shall not be stored on wooden pallets. (430:2-4.2)

24-2.4.3 Special care shall be taken to prevent any contamination of oxidizers in storage. (430:2-4.2.1)

24-2.5 Storage and Display of Oxidizing Materials in Retail Occupancies.

24-2.5.1 Oxidizing materials that are displayed in areas accessible to the general public shall meet the requirements of 24-2.5.1 through 24-2.6.

24-2.5.1.1* Oxidizing materials shall be separated from ordinary combustible and incompatible materials by a solid non-combustible barrier or by a horizontal distance of not less than 4 ft (1.2 m).

Exception No. 1: Ordinary combustibles shall not include approved packaging materials, pallets, or other dunnage used for the oxidizers.

Exception No. 2: Separation from ordinary combustible materials is not required for Class I oxidizers. (430:7-2.1)

24-2.5.1.2 Solid oxidizing materials shall not be displayed directly beneath liquids. (430:7-2.2)

24-2.5.1.3 Display of oxidizing materials shall extend no higher than 7 ft (2.1 m) from the floor to the top of the uppermost container. The display shall not exceed 4 ft (1.2 m) in depth. Shelves and vertical barriers shall be placed between incompatible materials and shall be solid and of noncombustible construction.

Exception: Display or storage of Class 2 and 3 oxidizers that meet the requirements of Section 7-4 of NFPA 430. (430:7-2.3)

24-2.5.1.4 Containers shall be approved for their intended use. Individual containers shall not exceed 100 lb (45.4 kg) capacity. (430:7-2.4)

24-2.5.1.5* For the purpose of this chapter, sprinklered retail occupancies storing and displaying oxidizers shall be protected using criteria from codes and standards applicable to the surrounding occupancy determined by the authority having jurisdiction. (430:7-2.5)

24-2.5.2 Quantity Limitations.

24-2.5.2.1 The quantity of oxidizing materials permitted in a retail occupancy shall not exceed the quantities given in Table 24-2.5.2.1 for either nonsprinklered or sprinklered areas, whichever is applicable.

Exception: Display or storage of Class 2 and 3 oxidizers that meets the requirements of Section 7-4 of NFPA 430. (430:7-3.1)

Table 24-2.5.2.1 Maximum Quantity of Oxidizers Allowed in Retail Occupancies Without Special Fire Protection, in Pounds

| Class of Material | Nonsprinklered | Sprinklered |
|-------------------|----------------|-------------|
| 3 | 1,150 | 2,300 |
| 2 | 2,250 | 4,500 |
| 1 | 18,000 | 36,000 |

[430: Table 7-3.1]

24-2.5.2.2 An equal quantity as permitted by Table 24-2.5.2.1 shall be permitted if the additional quantities are located in a separate area protected by a fire resistance of not less than 1 hour. (430:7-3.2)

24-2.5.2.3 If a storage area in a retail occupancy is separated from the rest of the facility by a fire partition having not less than a 2-hour fire resistance rating, the maximum quantity of oxidizing materials allowed in that area shall be permitted to be that allowed in Chapters 3, 4, and 5 of NFPA 430, as applicable. (430:7-3.3)

24-2.6 Where two or more different classes of oxidizers are stored in the same segregated, cutoff, or detached area, the maximum quantity permitted for each class shall be limited to the sum of the maximum proportion permitted for that class. The total of the proportional amounts shall not exceed 100 percent. (430:2-5)

24-2.7 Class 1 Oxidizers.

24-2.7.1 The storage of Class 1 oxidizers shall be segregated, cutoff, or detached. (430:3-2.1)

24-2.7.2 Storage of Class 1 oxidizers shall be in accordance with Tables 24-2.7.2(a) and 24-2.7.2(b). (430:3-2.2)

Table 24-2.7.2(a) Storage of Class 1 Oxidizers in a Nonsprinklered Building for Nonretail Establishment

| Storage Configurations and Allowable Distances | U.S. Units | Metric Units |
|--|------------|--------------|
| Building limit | 200 tons | 181 met ton |
| Pile limit | 20 tons | 18 met ton |
| Pile height | 8 ft | 2.4 m |
| Pile width | 16 ft | 4.9 m |
| Maximum distance from any container to a working aisle | 8 ft | 2.4 m |
| Distance to next pile | * | * |
| Distance to wall | 4 ft | 1.2 m |
| Distance to incompatible material | 12 ft | 3.7 m |

*Aisle width equal to pile height.

[430:Table 3-2.2(a)]

Table 24-2.7.2(b) Storage of Class 1 Oxidizers in a Sprinklered Building for Nonretail Establishment

| Storage Configurations and Allowable Distances | U.S. Units | Metric Units |
|--|------------|--------------|
| Building limit | 2000 tons | 1814 met ton |
| Pile limit | 200 tons | 181 met ton |
| Pile height | 12 ft | 3.7 m |
| Pile width | 24 ft | 7.3 m |
| Maximum distance from any container to a working aisle | 12 ft | 3.7 m |
| Distance to next pile | * | * |
| Distance to wall | 2 ft | 0.6 m |
| Distance to incompatible material | 8 ft | 2.4 m |

Note: If the storage is to be considered sprinklered, see Section 3-3 of NFPA 430.

*Aisle width equal to pile height.

[430:Table 3-2.2(b)]

24-2.7.3* The building limit (tons) shall be permitted to be four times the quantities shown in Table 24-2.7.2(b) if all of the following conditions are met:

- (1) Storage is cut off or detached.
- (2) Storage is located in nonretail occupancies.
- (3) Noncombustible containers are used or buildings are noncombustible. (430:3-2.3)

24-2.7.4 Bulk Storage.

24-2.7.4.1 Bulk storage in combustible buildings shall not come in contact with combustible building members unless the members are protected by a compatible coating to prevent their impregnation by the oxidizer. (430:3-2.4.1)

24-2.7.4.2 Bulk storage, either in permanent bins or in piles, shall be separated from all other materials. (430:3-2.4.2)

24-2.7.4.3 Bins shall be of noncombustible construction.

Exception: Wooden bins shall be permitted to be protected with a compatible coating to prevent impregnation of the combustible material by the oxidizer. (430:3-2.4.3)

24-2.7.4.4 Storage shall be managed to prevent excessive dust accumulation. (430:3-2.4.4)

24-2.7.5 Sprinkler Protection.

24-2.7.5.1 Sprinkler protection for Class 1 oxidizers shall be in accordance with Chapter 7 and NFPA 13, *Standard for the Installation of Sprinkler Systems*. (430:3-3.1)

24-2.7.5.2 For the purpose of applying the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*, Class 1 oxidizers in noncombustible or combustible containers (paper bags or noncombustible containers with removable combustible liners) shall be designated as a Class 1 commodity. Class 1 oxidizers contained in fiber packs or noncombustible containers in combustible packaging shall be designated as a Class 2 commodity. Class 1 oxidizers contained in plastic containers shall be designated as a Class 3 commodity. (430:3-3.2)

24-2.8 Class 2 Oxidizers.

24-2.8.1 The storage of Class 2 oxidizers shall be segregated, cutoff, or detached. (430:4-2.1)

24-2.8.2 Cutoff walls shall have a fire resistance rating of at least 1 hour. (430:4-2.2)

24-2.8.3 Storage of Class 2 oxidizers shall be in accordance with Tables 24-2.8.3(a) and 24-2.8.3(b). (430:4-2.3)

Table 24-2.8.3(a) Storage of Class 2 Oxidizers in a Nonsprinklered Building

| Storage Configurations and Allowable Distances | Segregated Storage Process Plant General Warehouse | | Cutoff Storage Process Plant General Warehouse | | Detached Storage | |
|--|--|--------------|--|--------------|------------------|--------------|
| | U.S. Units | Metric Units | U.S. Units | Metric Units | U.S. Units | Metric Units |
| Building limit | 50 tons | 45 met ton | 200 tons | 181 met ton | 300 tons | 272 met ton |
| Pile limit | 10 tons | 8.8 met ton | 20 tons | 18.1 met ton | 30 tons | 27.2 met ton |
| Pile height | 6 ft | 1.8 m | 8 ft | 2.4 m | 8 ft | 2.4 m |
| Pile width | 8 ft | 2.4 m | 12 ft | 3.7 m | 16 ft | 4.9 m |
| Maximum distance from any container to a working aisle | 4 ft | 1.2 m | 6 ft | 1.8 m | 8 ft | 2.4 m |
| Distance to next pile | * | * | * | * | * | * |
| Distance to wall | 4 ft | 1.2 m | 4 ft | 1.2 m | 4 ft | 1.2 m |
| Distance to incompatible material | 12 ft | 3.7 m | ** | ** | ** | ** |

*Aisle width equal to pile height.

**Not permitted by definition.

[430:Table 4-2.3(a)]

Table 24-2.8.3(b) Storage of Class 2 Oxidizers in a Sprinklered Building

| Storage Configurations and Allowable Distances | Segregated Storage Process Plant General Warehouse | | Cutoff Storage Process Plant General Warehouse | | Detached Storage | |
|--|--|--------------|--|--------------|------------------|--------------|
| | U.S. Units | Metric Units | U.S. Units | Metric Units | U.S. Units | Metric Units |
| Building limit | 100 tons | 91 met ton | 1000 tons | 907 met ton | 2000 tons | 1814 met ton |
| Pile limit | 20 tons | 18.1 met ton | 100 tons | 91 met ton | 200 tons | 181 met ton |
| Pile height* | * | * | * | * | | |
| Pile width | 16 ft | 4.9 m | 25 ft | 7.6 m | 25 ft | 7.6 m |
| Maximum distance from any container to a working aisle | 8 ft | 2.4 m | 12 ft | 3.7 m | 12 ft | 3.7 m |
| Distance to next pile | ** | ** | ** | ** | ** | ** |
| Distance to wall | 2 ft | 0.6 m | 2 ft | 0.6 m | 2 ft | 0.6 m |
| Distance to incompatible material | 12 ft | 3.7 m | *** | *** | *** | *** |

Note: If the storage is considered to be sprinklered, see Section 4-4 of NFPA 430.

*See 4-2.7 and Table 4-4.1 of NFPA 430.

**Aisle width equal to pile height.

***Not permitted by definition.

[430:Table 4-2.3(b)]

24-2.8.4* The building limit (tons) shall be permitted to be four times the quantities shown in Table 24-2.8.3(b) if all of the following conditions are met:

- (1) Storage is cut off or detached.
- (2) Storage is located in nonretail occupancies.
- (3) Noncombustible containers are used or buildings are noncombustible. (430:4-2.4)

24-2.8.5 Storage in glass carboys shall not be more than two carboys high. (430:4-2.5)

24-2.8.6 Storage in basements shall be prohibited.

Exception: Where the oxidizer is stored in fixed tanks. (430:4-2.6)

24-2.8.7 Building Construction.

24-2.8.7.1 Construction materials that are permitted to be in contact with oxidizers, all cutoff partitions, and all construction in stories or basements below storage of liquid oxidizers shall be noncombustible. (430:4-3.1)

24-2.8.7.2 Storage areas for oxidizing materials in combustible containers shall be provided with means to vent fumes in a fire emergency. (430:4-3.2)

24-2.8.8 Sprinkler Protection.

24-2.8.8.1 Sprinkler protection for Class 2 oxidizers shall be designed in accordance with Table 4-4.1 of NFPA 430. (430:4-4.1)

24-2.8.8.2 Sprinkler protection shall be installed in accordance with Chapter 7 and NFPA 13, *Standard for the Installation of Sprinkler Systems*. (430:4-4.2)

24-2.8.9 Detached Storage.

24-2.8.9.1 To be considered detached, a sprinklered building for storage of Class 2 oxidizers shall be a minimum of 35 ft

(10.7 m) from other buildings and from a line of property that can be built upon. (430:4-5.1)

24-2.8.9.2 To be considered detached, a nonsprinklered building for storage of Class 2 oxidizers shall be located no less than 50 ft (15.2 m) from other buildings or a line of property that can be built upon. (430:4-5.2)

24-2.9 Class 3 Oxidizers.

24-2.9.1 The storage of Class 3 oxidizers shall be segregated, cutoff, or detached.

Exception: Storage for sodium chlorate, potassium chlorate, sodium bromate, potassium bromate, and ammonium dichromate shall only be cutoff or detached, not segregated. (430:5-2.1)

24-2.9.2 Class 3 oxidizer storage shall be located on the ground floor only. (430:5-2.2)

24-2.9.3 Cutoff walls shall have a fire resistance rating of at least 2 hours. (430:5-2.3)

24-2.9.4 Storage of Class 3 oxidizers shall be in accordance with Tables 24-2.9.4(a) and 24-2.9.4(b). (430:5-2.4)

24-2.9.5* The building limit (tons) shall be permitted to be twice the quantities shown in Table 24-2.9.4(b) if all of the following conditions are met:

- (1) Storage is cut off or detached.
- (2) Noncombustible containers are used or buildings are noncombustible.
- (3) Storage is located in nonretail occupancies. (430:5-2.5)

24-2.9.6 Storage in glass carboys shall be one carboy high. (430:5-2.6)

24-2.9.7 Bulk storage in open bins or piles shall not be permitted. (430:5-2.7)

Table 24-2.9.4(a) Storage of Class 3 Oxidizers in a Nonsprinklered Building

| Storage Limit | Segregated Storage | | Cutoff Storage | | Detached Storage | |
|--|------------------------------------|--------------|------------------------------------|--------------|------------------|--------------|
| | Process Plant General Warehouse | | Process Plant General Warehouse | | | |
| | U.S. Units | Metric Units | U.S. Units | Metric Units | U.S. Units | Metric Units |
| Building limit | 20 tons | 18.1 met ton | 100 tons | 91 met ton | 200 tons | 181 met ton |
| Pile limit | 5 tons | 4.5 met ton | 10 tons | 9.1 met ton | 30 tons | 27.2 met ton |
| Pile height | 6 ft | 1.8 m | 6 ft | 1.8 m | 6 ft | 1.8 m |
| Pile width | 8 ft | 2.4 m | 12 ft | 3.7 m | 12 ft | 3.7 m |
| Maximum distance from any container to a working aisle | 4 ft | 1.2 m | 8 ft | 2.4 m | 8 ft | 2.4 m |
| Distance to next pile | * | * | * | * | * | * |
| Distance to wall | 4 ft | 1.2 m | 4 ft | 1.2 m | 4 ft | 1.2 m |
| Distance to incompatible material | 12 ft | 3.7 m | ** | ** | ** | ** |

*Aisle width equal to pile height.

**Not permitted by definition.

[430:Table 5-2.4(a)]

Table 24-2.9.4(b) Storage of Class 3 Oxidizers in a Sprinklered Building

| Storage Limit | Segregated Storage Process Plant General Warehouse | | Cutoff Storage Process Plant General Warehouse | | Detached Storage | |
|--|--|--------------|--|--------------|------------------|--------------|
| | U.S. Units | Metric Units | U.S. Units | Metric Units | U.S. Units | Metric Units |
| Building limit | 50 tons | 45 met ton | 500 tons | 454 met ton | 1500 tons | 1360 met ton |
| Pile limit | 10 tons | 8.8 met ton | 30 tons | 27.2 met ton | 100 tons | 91 met ton |
| Pile height* | * | * | * | * | * | * |
| Pile width | 12 ft | 3.7 m | 16 ft | 4.9 m | 20 ft | 6.1 m |
| Maximum distance from any container to a working aisle | 8 ft | 2.4 m | 10 ft | 3 m | 10 ft | 3 m |
| Distance to next pile | ** | ** | ** | ** | ** | ** |
| Distance to wall | 2 ft | 0.6 m | 2 ft | 0.6 m | 2 ft | 0.6 m |
| Distance to incompatible material | 12 ft | 3.7 m | *** | *** | *** | *** |

Note: If the storage is considered to be sprinklered, the sprinkler system shall be designed in accordance with the requirements of Section 5-4 of NFPA 430.

*See 5-2.8 and Table 5-4.1 of NFPA 430.

**Aisle width equal to pile height.

***Not permitted by definition.

[430:Table 5-2.4(b)]

24-2.9.8 Building Construction.

24-2.9.8.1 Buildings used for the storage of liquid Class 3 oxidizers shall not have basements. (430:5-3.1)

24-2.9.8.2 Construction materials that can come in contact with oxidizers shall be noncombustible. (430:5-3.2)

24-2.9.8.3 Storage areas for oxidizing materials in combustible containers shall be provided with means to vent fumes in a fire emergency. (430:5-3.3)

24-2.9.9 Sprinkler Protection.

24-2.9.9.1 Sprinkler protection for Class 3 oxidizers shall be designed in accordance with Table 5-4.1 of NFPA 430. (430:5-4.1)

24-2.9.9.2 Sprinkler protection shall be installed in accordance with Chapter 7 and NFPA 13, *Standard for the Installation of Sprinkler Systems*. (430:5-4.2)

24-2.9.10 Detached Storage. To be considered detached, a building for storage of Class 3 oxidizers shall be separated from flammable or combustible liquid storage, flammable gas storage, combustible material in the open, and any inhabited building, passenger railroad, public highway, or other tanks. The minimum separation distance shall be one of the following:

- (1) 50 ft (15 m) for a sprinklered building
- (2) 75 ft (23 m) for an unsprinklered building (430:5-5)

24-2.10 Class 4 Oxidizers.

24-2.10.1 The storage of Class 4 oxidizers shall be detached. (430:6-2.1)

24-2.10.2 Storage in glass carboys shall be one carboy high. Storage in drums or in containers or in cases shall not exceed the limits outlined in Table 24-2.10.2. (430:6-2.2)

Table 24-2.10.2 Storage of Class 4 Oxidizers in Drums, Containers, and Cases

| Storage Configurations and Quantities | Nonsprinklered Building | | Sprinklered Building | |
|---------------------------------------|-------------------------|--------------|----------------------|--------------|
| | U.S. Units | Metric Units | U.S. Units | Metric Units |
| Piles | | | | |
| Length | 10 ft | 3.0 m | 10 ft | 3.0 m |
| Width | 4 ft | 1.2 m | 4 ft | 1.2 m |
| Height | 4 ft | 1.2 m | 8 ft | 2.4 m |
| Distance to next pile | 6 ft | 1.8 m | 8 ft | 2.4 m |
| Quantity limit per building | 1 ton | 0.9 met tons | No limit | |

(430:Table 6-2.2)

24-2.10.3 Bulk storage in piles or fixed bins shall not be permitted. (430:6-2.3)

24-2.10.4 Building Construction and Location.

24-2.10.4.1 Buildings shall be constructed as one story without basement. Construction materials that could come in contact with oxidizers shall be noncombustible. (430:6-3.1)

24-2.10.4.2 Storage areas shall be provided with means to vent fumes in an emergency. (430:6-3.2)

24-2.10.4.3 A storage building or storage tank shall be located not less than the minimum distance shown in Table 24-2.10.4.3 from flammable liquid storage, combustible material in the open, and any inhabited building, passenger railroad, public highway, property line, or tank other than oxidizer storage. (430:6-3.3)

Table 24-2.10.4.3 Separation of Buildings, Tanks Containing Class 4 Oxidizers

| Weight of Class 4 Oxidizer | | Distance | |
|----------------------------|-------------|--|-----|
| lb | kg | ft | m |
| over 10–100 | 4.5–45.4 | 75 | 23 |
| 101–500 | 4.5–227 | 100 | 30 |
| 501–1,000 | 227–454 | 125 | 38 |
| 1,001–3,000 | 454–1,361 | 200 | 61 |
| 3,001–5,000 | 1,361–2,268 | 300 | 91 |
| 5,001–10,000 | 2,268–4,536 | 400 | 122 |
| over 10,000 | over 4,536 | Subject to approval by the authority having jurisdiction | |

(430:Table 6-3.4)

24-2.10.4.4 Where tanks are not separated from each other by 10 percent of the distance specified in Table 24-2.10.4.3 for the largest tank, the total contents of all tanks shall be used when using Table 24-2.10.4.3. (430:6-3.4)

24-2.10.4.5 Sprinkler Protection.

24-2.10.4.5.1 Sprinkler protection for Class 4 oxidizers shall be installed on a deluge sprinkler system to provide water density of 0.35 gal/min/ft² (14.4 L/min/m²) over the entire storage area. (430:6-4.1)

24-2.10.4.5.2 Sprinkler protection shall be installed in accordance with Chapter 7 and NFPA 13, *Standard for the Installation of Sprinkler Systems*. (430:6-4.2)

24-3 Organic Peroxide Formulations.

24-3.1 Application.

24-3.1.1 Indoor storage of organic peroxide formulations shall be in accordance with the provisions of this section and NFPA 432, *Code for the Storage of Organic Peroxide Formulations*.

24-3.1.2 This section shall apply only to commercially available organic peroxide formulations in U.S. Department of Transportation- or Canadian Ministry of Transport-approved packages. (432:1-1.1)

24-3.1.3 This section shall not apply to the storage of such formulations in process areas where they are manufactured or used. (432:1-1.2)

24-3.1.4 This section shall not apply to organic peroxide formulations that are capable of detonation in their normal shipping containers under conditions of fire exposure. Such formulations shall be handled and stored as Explosives 1.1 (formerly known as Class A) explosives in accordance with NFPA 495, *Explosive Materials Code*. (432:1-1.3)

24-3.2 Classification of Organic Peroxide Formulations. For the purpose of this Section, organic peroxide formulations shall be classified according to the system described in 24-3.2(a) through (e). The system is based on the behavior of certain specific formulations in their U.S. Department of Transportation or Canadian Ministry of Transport approved shipping containers and under conditions of fire exposure. (See Chapter 2 for definition of Organic Peroxide Formulations. See Appendix B for classification of typical organic peroxide formulations.) (432:1-6)

(a) *Class I.* Those formulations that are capable of deflagration but not detonation. (432:1-6.1)

(b) *Class II.* Those formulations that burn very rapidly and that present a severe reactivity hazard. (432:1-6.2)

(c) *Class III.* Those formulations that burn rapidly and that present a moderate reactivity hazard. (432:1-6.3)

(d) *Class IV.* Those formulations that burn in the same manner as ordinary combustibles and that present a minimal reactivity hazard. (432:1-6.4)

(e) *Class V.* Those formulations that burn with less intensity than ordinary combustibles or do not sustain combustion and that present no reactivity hazard. (432:1-6.5)

24-3.3 Indoor Storage.

24-3.3.1 Indoor storage of organic peroxide formulations shall be in accordance with the provisions of this section and NFPA 432, *Code for the Storage of Organic Peroxide Formulations*.

24-3.3.2 Class I organic peroxide formulations shall not be permitted in public assembly, educational, health care, detention and correctional occupancies, or in classrooms of business occupancies used for adult instruction.

Exception: Where arrangements for the storage of Class I organic peroxide formulations are approved by the authority having jurisdiction, they shall be permitted.

24-3.3.3 Storage areas shall be maintained within the recommended storage temperature range for the materials stored. (See Appendix B for compounds needing refrigeration systems.) (432:2-4.1)

24-3.4 Identification. All storage areas containing organic peroxide formulations shall be conspicuously identified by the words "Organic Peroxides" and by the class, as defined in 24-3.2. (432:2-1)

24-3.4.1 When organic peroxide formulations having different classifications as defined in 24-3.2 are stored in the same area, the area shall be marked for the most severe class present. (432:2-1.1)

24-3.4.2 Packages containing organic peroxide formulations shall be individually marked with the chemical name of the organic peroxide or with other pertinent information to allow proper area classification as required by 24-3.4. (432:2-1.2)

24-3.4.3 Packages containing organic peroxide formulations that require temperature control shall be marked with the recommended storage temperature range. (432:2-1.3)

24-3.5 General Storage Requirements.

24-3.5.1 Storage shall be arranged to facilitate manual access and handling, to maintain pile stability, to minimize breakage and spillage, and to promote good housekeeping. (432:2-11.1)

24-3.5.2 A clear space of at least 2 ft (0.6 m) shall be maintained between organic peroxide storage and uninsulated metal walls. (432:2-11.2)

24-3.5.3 Separation Distance.

24-3.5.3.1 Incompatible materials and flammable liquids shall not be stored within 25 ft (7.6 m) of organic peroxide formulations. The effective separation distance shall be maintained by floor slope, drains, or dikes to prevent liquid leakage from encroaching on the organic peroxide formulation storage area.

Exception: Organic peroxide formulations that can also be classified as flammable liquids by their flash point shall be permitted to be stored with other organic peroxide formulations, and the more restrictive re-

quirements of NFPA 30, *Flammable and Combustible Liquids Code*, or NFPA 432, *Code for the Storage of Organic Peroxide Formulations*, shall apply. (432:2-11.3.1)

24-3.5.3.2 As an alternative to the 25-ft (7.6-m) separation distance, a 1-hour, liquidtight fire barrier shall be permitted. (432:2-11.3.2)

24-3.5.4 Only closed containers and packages shall be permitted in storage areas. (432:2-11.4)

24-3.5.5 Storage of bags, drums, and other containers and packages of organic peroxide formulations shall be in accordance with Table 24-3.5.5. (432:2-11.5)

24-3.5.6 55-gal (208-L) drum storage of Class II and Class III organic peroxide formulations shall be stored one high only. (432:2-11.6)

24-3.5.7 Storage of Class V organic peroxide formulations shall meet the requirements of NFPA 230, *Standard for the Fire Protection of Storage*, as applicable. (432:2-11.7)

24-3.6 Storage Limitations.

24-3.6.1 Storage of organic peroxide formulations shall be limited to those areas within the scope of NFPA 432, *Code for the Storage of Organic Peroxide Formulations*. The maximum allowable quantities of organic peroxide formulations that can be stored in a single area or building shall depend on the classification of the formulations and the classification of the storage facility, as set forth in Tables 24-3.6.1(a) and 24-3.6.1(b). (432:2-10.1)

Table 24-3.5.5 Provisions for Storage Arrangement by Class of Organic Peroxide Formulation

| Class of Organic Peroxide Formulation | Maximum Pile Height | | Maximum Pile Width | | Minimum Main Aisle Width | | Minimum Additional Aisles Width | |
|---------------------------------------|-------------------------|-----|--------------------|-----|--------------------------|-----|---------------------------------|-----|
| | ft | m | ft | m | ft | m | ft | m |
| I | 6 | 1.8 | 4 | 1.2 | 8 | 2.4 | 4 | 1.2 |
| II* | 8 | 2.4 | 8 | 2.4 | 6 | 1.8 | 4 | 1.2 |
| III* | 8 | 2.4 | 8 | 2.4 | 6 | 1.8 | 4 | 1.2 |
| IV | 10 | 3 | 16 | 4.9 | 4 | 1.2 | 3 | 0.9 |
| V | See 2-11.7 of NFPA 432. | | | | | | | |

*See 2-11.6 of NFPA 432.
(432:Table 2-11.5)

Table 24-3.6.1(a) Maximum Allowable Quantity of Organic Peroxide Formulations in Nonsprinklered Buildings

| Class of Organic Peroxide Formulation | Segregated Storage | | Cut-off Storage | | Detached Storage Minimum Separation* | | | | | |
|---------------------------------------|--------------------|--------|-----------------|--------|--------------------------------------|---------|-----------------|---------|---------------|---------|
| | | | | | 50 ft (15 m) | | 100 ft (30.5 m) | | 150 ft (46 m) | |
| | lb | kg | lb | kg | lb | kg | lb | kg | lb | kg |
| I | NA | NA | NA | NA | 1000 | 454 | 4000 | 1810 | 10,000 | 4540 |
| II | NA | NA | 2000 | 907 | 20,000 | 9070 | 80,000 | 36,300 | 500,000 | 227,000 |
| III | 1500 | 680 | 3000 | 1360 | 70,000 | 31,800 | 200,000 | 90,700 | 750,000 | 340,000 |
| IV | 100,000 | 45,400 | 200,000 | 90,700 | 300,000 | 136,000 | 500,000 | 227,000 | 1,000,000 | 454,000 |
| V | UNL | UNL | UNL | UNL | UNL | UNL | UNL | UNL | UNL | UNL |

*Minimum separation means the distance from the line of property that is or can be built upon, including the opposite side of a public way, or the distance from the nearest important building on the same property.

NA — Not allowed

UNL — Unlimited

[432:Table 2-10(a)]

Table 24-3.6.1(b) Maximum Allowable Quantity of Organic Peroxide Formulations in Sprinklered Buildings

| Class of Organic Peroxide Formulation | Segregated Storage | | Cut-off Storage | | Detached Storage Minimum Separation* | | | | | |
|---------------------------------------|--------------------|--------|-----------------|--------|--------------------------------------|--------|-----------------|--------|---------------|--------|
| | | | | | 50 ft (15 m) | | 100 ft (30.5 m) | | 150 ft (46 m) | |
| | lb | kg | lb | kg | lb | kg | lb | kg | lb | kg |
| I | NA | NA | 2000 | 907 | 2000 | 907 | 20,000 | 9070 | 175,000 | 79,400 |
| II | 4000 | 1810 | 50,000 | 22,700 | 100,000 | 45,400 | 200,000 | 90,700 | UNL | UNL |
| III | 50,000 | 22,700 | 100,000 | 45,400 | 200,000 | 90,700 | UNL | UNL | UNL | UNL |
| IV | UNL | UNL | UNL | UNL | UNL | UNL | UNL | UNL | UNL | UNL |
| V | UNL | UNL | UNL | UNL | UNL | UNL | UNL | UNL | UNL | UNL |

*Minimum separation means the distance from the line of property that is or can be built upon, including the opposite side of a public way, or the distance from the nearest important building on the same property.

NA — Not allowed

UNL — Unlimited

[432:Table 2-10(b)]

24-3.6.1.1 The quantity of Class III organic peroxide formulations as it appears in Table 24-3.6.1(a) in cut-off storage shall be permitted to be increased to 20,000 lb (9070 kg) if the walls or partitions providing the cut-off have a fire resistance rating of at least 4 hours. (432:2-10.1.1)

24-3.6.1.2 Class I organic peroxide formulation cut-off storage as it appears in Table 24-3.6.1(b) shall have interior walls with a blast resistance of 432 psf (0.2 bar). (432:2-10.1.2)

24-3.6.1.3* Class I organic peroxide formulation cut-off storage as it appears in Table 24-3.6.1(b) shall have deflagration venting provided for exterior walls. (432:2-10.1.3)

24-3.6.2 Where two or more different classes of organic peroxide formulations are stored in the same area, the maximum quantity permitted shall be limited to the sum of the proportional amounts that each class bears to the maximum permitted for that class. The total of the proportional amounts shall not exceed 100 percent. (432:2-10.2)

24-3.6.3 Where the storage area is protected by a specially engineered fire protection system acceptable to the authority having jurisdiction, the quantity of organic peroxide formulations shall be permitted to be increased. (432:2-10.3)

24-3.6.4 Organic peroxide formulations shall not be stored where they can be exposed to explosive materials. (432:2-10.4)

24-3.6.5 Where required by other provisions of NFPA 432, automatic sprinklers and water spray systems shall be designed and installed according to the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*, and NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, and shall provide the following discharge densities:

Class I — 0.50 gpm/ft² (20.4 Lpm/m²)

Class II — 0.40 gpm/ft² (16.3 Lpm/m²)

Class III — 0.30 gpm/ft² (12.2 Lpm/m²)

Class IV — 0.25 gpm/ft² (10.2 Lpm/m²)

For Class I organic peroxide formulations, see 24-3.9.3.2. (432:2-8.2)

24-3.6.5.1 The system shall be designed to provide the required density over a 3000 ft² (280 m²) area for areas protected by a wet pipe sprinkler system or 3900 ft² (360 m²) for areas protected by a dry pipe sprinkler system. The entire area of any building of less than 3000 ft² (280 m²) shall be used as the area of application. (432:2-8.2.1)

24-3.6.5.2 Where required, water supplies for automatic sprinklers, fire hydrants, and so forth, shall be provided in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, and shall be capable of supplying the anticipated demand for at least 90 minutes. (432:2-8.3)

24-3.7 Segregated Storage.

24-3.7.1 This section shall apply to the storage of organic peroxide formulations when stored under segregated conditions as defined in 2-1.115.3 of this Code and in quantities not exceeding those shown in Tables 24-3.6.1(a) and 24-3.6.1(b). (432:3-1)

24-3.7.2 If there are any floors or open spaces located below the organic peroxide storage area, the floor of the storage area shall be made water-tight and shall be provided with drainage that leads to a safe location. Every means shall be taken to ensure that spilled material cannot run down into areas below the organic peroxide storage area. (432:3-3)

24-3.7.3 Storage Arrangement.

24-3.7.3.1 A minimum of 8 ft (2.4 m) of clear space shall be maintained between organic peroxide storage and any other storage. (432:3-4.1)

24-3.7.3.2 Segregated storage areas shall meet all applicable requirements of NFPA 230, *Standard for the Fire Protection of Storage*, as applicable. (432:3-4.2)

24-3.7.3.3* A clear space of at least 4 ft (1.2 m) shall be maintained between organic peroxide storage and any walls of combustible or limited-combustible construction. (432:3-4.3)

24-3.8 Cut-off Storage. This section shall apply to the storage of organic peroxide formulations when stored under cut-off conditions as defined in 2-1.115.1 and in quantities not exceeding those shown in Tables 24-3.6.1(a) and 24-3.6.1(b). (432:4-1)

24-3.8.1 Building Construction.

24-3.8.1.1 Cut-off storage areas for Class I, Class II, or any refrigerated organic peroxide formulations shall be single story, without basements or crawl spaces. (432:4-3.1)

24-3.8.1.2 Where any Class I organic peroxide formulations are stored in excess of 100 lb (45 kg), internal walls and any wall, roof, or ceiling that joins with another occupied building shall be capable of withstanding an internal overpressure of 432 psf (0.2 bar). (432:4-3.2)

24-3.8.1.3 Where Class II or any refrigerated organic peroxide formulations are stored, any internal walls or any wall, roof, or ceiling that joins with another occupied building shall be capable of withstanding an internal overpressure of 125 psf (0.06 bar). (432:4-3.3)

24-3.8.1.4* For Class I, Class II, or any refrigerated organic peroxide formulation that gives off flammable gases upon decomposition, the storage area shall be provided with deflagration venting. (432:4-3.4)

24-3.8.1.5 Any walls common with another building shall have a fire resistance of at least 2 hours, as measured by the procedure described in NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*. (432:4-3.5)

24-3.8.1.6 Any door or window openings in such walls shall be protected by approved fire doors and fire windows suitable for the opening and shall be installed according to NFPA 80, *Standard for Fire Doors and Fire Windows*. (432:4-3.5.1)

24-3.8.2* Storage Arrangement. A clear space of at least 4 ft (1.2 m) shall be maintained between organic peroxide storage and any walls of combustible or limited-combustible construction. (432:4-4)

24-3.9 Detached Storage. This section shall apply to the storage of organic peroxide formulations when stored under detached conditions as defined in 2-1.115.2 and in quantities and at separation distances as specified in Tables 24-3.6.1(a) and 24-3.6.1(b). (432:5-1)

24-3.9.1 Building Location.

24-3.9.1.1 Detached storage buildings shall be separated from the lines of property that are or can be built upon, including the opposite side of a public way, or from the nearest important building on the same property. (432:5-3.1)

24-3.9.1.2 For Classes II, III, and IV organic peroxide formulations, detached storage buildings separated by less than 50 ft (15.3 m) shall be considered to be a single area when applying the limits for Tables 24-3.6.1(a) and 24-3.6.1(b). (432:5-3.2)

24-3.9.1.3 For Class I organic peroxide formulations, detached storage buildings shall be separated from each other in accordance with Table 24-3.9.1.3. (432:5-3.3)

Table 24-3.9.1.3 Separation of Individual Storage Buildings

| Nonsprinklered | | | | Automatic Sprinklered | | | |
|----------------|------|----------|----|-----------------------|--------|----------|----|
| Quantity | | Distance | | Quantity | | Distance | |
| lb | kg | ft | m | lb | kg | ft | m |
| 1000 | 454 | 20 | 6 | 2000 | 907 | 20 | 6 |
| 4000 | 1810 | 75 | 23 | 20,000 | 9070 | 75 | 23 |
| 10,000 | 4540 | 100 | 30 | 175,000 | 79,400 | 100 | 30 |

(432:Table 5-3.3)

24-3.9.2 Building Construction and Utilities.

24-3.9.2.1 Detached storage buildings shall be single story, without basement or crawl space. (432:5-4.1)

24-3.9.2.2 Nonsprinklered buildings for storing more than 5000 lb (2270 kg) of Class I, Class II, or any refrigerated organic peroxide formulation that gives off flammable gases upon decomposition shall be built of noncombustible construction. (432:5-4.2)

24-3.9.2.3 Buildings of combustible construction employing sun shields such as those illustrated in Figure A-5-4.3 of NFPA 432 shall be permitted to be used for detached storage buildings storing less than 5000 lb (2270 kg) of organic peroxide formulation in those areas where the temperature inside the storage building can approach or exceed the maximum recommended storage temperature. (432:5-4.3)

24-3.9.3 Fire Protection.

24-3.9.3.1 Where required, automatic sprinkler systems and their water supplies shall meet the requirements of 24-3.6.5 and 24-3.6.5.2. (432:5-5.1)

24-3.9.3.2 Where required for Class I organic peroxide formulations in quantities exceeding 2000 lb (907 kg), automatic sprinkler protection shall be open-head deluge-type, designed and installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*. (432:5-5.2)

24-3.10 In addition to the provisions of Section 24-3, exterior storage areas for organic peroxide formulations exceeding the maximum quantities specified in Tables 24-3.6.1(a) and 24-3.6.1(b) shall be located a minimum distance of 50 ft (15 m) from other hazardous materials storage.

Chapter 25 Parking Garages

25-1 General.

25-1.1 The construction and protection of new and existing parking garages as well as the control of hazards in open parking structures, enclosed parking structures, and basement and underground parking structures shall comply with this chapter and NFPA 88A, *Standard for Parking Structures*.

25-1.2 This chapter shall not apply to parking garages in one- and two-family dwellings.

Chapter 26 Pesticides and Herbicides

26-1 General.

26-1.1* This chapter shall apply to restricted use pesticides, which are required by the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), 40 CFR, Part 152.175, to bear the human signal word "Danger" [as defined in 40 CFR, Part 156.10(i) (A)] or those restricted use pesticides, which when evaluated against NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*, (Health Hazard Warning Determination), are determined to be rated as "3" or "4." (434:1-1.2)

26-1.2 The inside and outside storage of pesticides shall comply with this chapter and NFPA 434, *Code for the Storage of Pesticides*.

26-2 Application.

26-2.1 This chapter shall not apply to sanitizers and disinfectants covered by other codes. (434:1-1.3)

26-2.2 This chapter shall not apply where storage at a site is equal to or less than 1000 gal (3790 L) or 10,000 lb (4540 kg). This chapter shall not apply where pesticide storage time in a calendar year is 14 days or less.

Exception No. 1: Hazard identification as specified in Section 2-6 of NFPA 434 shall apply to all pesticide storage facilities.

Exception No. 2: This chapter shall apply to tank trucks, rail cars, or any other transportation vehicle involved in the temporary pesticide storage. (See 2-2.2.3 of NFPA 434.) (434:1-1.4)

26-2.3 Existing buildings storing pesticides that do not comply with the requirements of this chapter that pertaining to noncombustible construction and fixed fire protection shall be permitted to be used at the discretion of the authority having jurisdiction, provided their use does not constitute a distinct hazard to life or adjoining property. (434:1-1.5)

26-3 Applicability of Other Documents.

26-3.1 The requirements of NFPA 30, *Flammable and Combustible Liquids Code*; NFPA 30B, *Code for the Manufacture and Storage of Aerosol Products*; NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers*; NFPA 230, *Standard for the Fire Protection of Storage*; and NFPA 490, *Code for the Storage of Ammonium Nitrate*,

shall apply where applicable and where they are more restrictive than NFPA 434, *Code for the Storage of Pesticides*. (434:1-3)

26-3.2 Pesticides covered in this chapter that are stored in the same facility with oxidizers shall be stored in accordance with Chapter 24 and NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers*. (434:1-3.1)

26-3.3 Pesticides stored in the same facility with ammonium nitrate fertilizer shall be stored in accordance with this chapter and NFPA 490, *Code for the Storage of Ammonium Nitrate*. (434:1-3.2)

26-4 Hazard Identification. All pesticide storage facilities shall have a hazard identification system. (434:2-6)

26-4.1 Signs. All pesticide storage areas shall be identified by a sign in accordance with NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*. Additionally, a sign that reads PESTICIDES in black 2-in. (5-cm) letters on a white background shall be posted. These signs shall be located in accordance with the authority having jurisdiction and shall meet EPA requirements. (434:2-6.1)

26-4.2 Container Labels. Each container shall have a legible FIFRA label on the outside of the container that is visible from the usual directions of approach. (434:2-6.2)

26-5 Temporary Storage. Tank trucks, rail cars, or any other transportation vehicle involved in temporary storage of pesticides at any one facility for three days or longer shall be provided with secondary containment. (434:2-2.2.3)

Chapter 27 Manufactured Home and Recreational Vehicle Sites

27-1 Manufactured Home Sites.

27-1.1 The fire safety requirements for the installation of manufactured homes and manufactured home sites, including accessory buildings, structures, and communities, shall comply with this section and NFPA 501A, *Standard for Fire Safety Criteria for Manufactured Home Installations, Sites, and Communities*.

27-1.2* This section shall not cover the equipment and installations used in the design, construction, transportation, fire safety, plumbing, heat-producing, and electrical systems of manufactured homes that are designed to be used as dwelling units.

27-2 Recreational Vehicle Parks and Campgrounds.

27-2.1 The construction of recreational vehicle parks and campgrounds that offer temporary living sites for use by recreational vehicles and camping units shall comply with this section and NFPA 1194, *Standard for Recreational Vehicle Parks and Campgrounds*.

27-2.2* This section shall not cover the design of recreational vehicles or other forms of camping units nor the operational and maintenance practices for recreational vehicle parks and campgrounds.

Chapter 28 Refueling

28-1 General. This chapter shall apply to the refueling of automotive vehicles, aircraft, and marine vessels.

28-2 Automotive Fuel Servicing.

28-2.1 General Requirements.

28-2.1.1 New and existing automotive service stations, service stations located inside buildings, and fleet vehicle service stations, as well as the refueling processes at these facilities shall comply with this section and NFPA 30A, *Automotive and Marine Service Station Code*.

28-2.1.2 This section shall not apply to those service stations, or portions of service stations, where liquefied petroleum gases, liquefied natural gases, or compressed natural gases are dispensed as automotive fuels. (See Section 28-5.) (30A:1-1.2)

28-2.1.3 This section shall not apply to fueling facilities at remote locations for large, off-the-road earthmoving and construction vehicles. (30A:1-1.3)

28-2.1.4 Permits, where required, shall comply with Section 1-16.

28-2.2 Storage Requirements.

28-2.2.1 General Provisions.

28-2.2.1.1 Liquids shall be stored in the following:

- (1) Approved closed containers not exceeding 60 gal (227 L) capacity
- (2) Tanks in special enclosures inside buildings as described in Section 2-2 of NFPA 30A
- (3) Aboveground tanks supplying marine service stations as provided in 28-2.2.1.4
- (4) An approved tank that is part of a fuel dispensing system as provided for in 28-2.8.3.5
- (5) Tanks located underground as in Section 2-4 of NFPA 30, *Flammable and Combustible Liquids Code*
- (6) Tanks or containers inside service station buildings as provided for in 28-2.2.3.4 and 28-2.2.3.5, or
- (7) Aboveground storage tanks located at service stations with the approval of the authority having jurisdiction and as provided for in 28-2.2.4 (30A:2-1.1)

28-2.2.1.2 Apparatus dispensing Class I liquids into the fuel tanks of motor vehicles of the public shall not be located at a bulk plant unless separated by a fence or similar barrier from the area in which bulk operations are conducted. Aboveground tanks located at a bulk plant shall not be connected by piping to service station tanks. (30A:2-1.3)

28-2.2.1.3 Class I liquids shall not be stored or handled within a building having a basement or pit into which flammable vapors can travel, unless such area is provided with ventilation that will prevent the accumulation of flammable vapors therein. (30A:2-1.4)

28-2.2.1.4 Tanks supplying marine service stations and pumps not integral with the dispensing device shall be on shore or on a pier of the solid-fill type, except as provided in (1) and (2).

- (1) Where shore location would require excessively long supply lines to dispensers, tanks shall be permitted to be located on a pier, provided that applicable portions of NFPA 30, *Flammable and Combustible Liquids Code*, Chapter 2, relative to spacing, diking, and piping, and Chapter 5,

Table 5-9.5.3, relative to electrical classification, are complied with and the quantity so stored does not exceed 1100 gal (4164 L) aggregate capacity.

- (2) Shore tanks supplying marine service stations shall be permitted to be located above ground where rock ledges or high water tables make underground tanks impractical. (See also Section 2-4 of NFPA 30A.) (30A:2-1.6)

28-2.2.1.5* Accurate daily inventory records shall be maintained and reconciled on all Class I liquid and diesel fuel storage tanks for indication of possible leakage from tanks or piping. The records shall be kept at the premises or made available for inspection by the enforcing authority within 24 hours of a written or verbal request. The records shall include, as a minimum, records showing by product, daily reconciliation between sales, use, receipts, and inventory on hand. If there is more than one system consisting of a tank(s) serving a separate pump(s) or dispenser(s) for any product, the reconciliation shall be maintained separately for each tank system. (30A:2-1.5)

28-2.2.2 Special Enclosures.

28-2.2.2.1 Enclosure shall be substantially liquidtight and vaportight without backfill. Sides, top, and bottom of the enclosure shall be of reinforced concrete at least 6 in. (15 cm) thick, with openings for inspection through the top only. Tank connections shall be so piped or closed that neither vapors nor liquid can escape into the enclosed space. Means shall be provided to use portable equipment to discharge to the outside any liquid or vapors that might accumulate should leakage occur. (30A:2-2.2)

28-2.2.2.2 At automotive service stations provided in connection with tenant or customer parking facilities in large buildings of commercial, mercantile, or residential occupancy, tanks containing Class I liquids installed in accordance with 28-2.2.2.1 shall not exceed 6000 gal (22,710 L) individual or 18,000 gal (68,130 L) aggregate capacity. (30A:2-2.3)

28-2.2.3 Inside Buildings.

28-2.2.3.1 Except where stored in tanks as provided in Section 2-2 of NFPA 30A, no Class I liquids shall be stored within any service station building except in closed containers of aggregate capacity not exceeding 120 gal (454.2 L). One container not exceeding 60 gal (227 L) capacity equipped with a listed pump shall be permitted. (30A:2-3.1)

28-2.2.3.2 Openings for gaging on tanks storing Class I liquids shall be provided with a vaportight cap or cover. Such covers shall be closed when not gaging. (30:2-3.8.3)

28-2.2.3.3 Class I liquids shall be permitted to be transferred from one container to another in lubrication or service rooms of a service station building provided the electrical installation complies with Chapter 7 of NFPA 30A, *Automotive and Marine Service Station Code*, and provided that any heating equipment complies with Chapter 8 of NFPA 30A. (See also 28-2.8.7 for other possible sources of ignition.) (30A:2-3.2)

28-2.2.3.4 Class II and Class IIIA liquids shall be permitted to be stored and dispensed inside service station buildings from approved tanks of not more than 120 gal (454 L) for each class, with an aggregate capacity not exceeding 240 gal (908 L). (30A:2-3.3)

28-2.2.3.5 Class IIIB liquids shall be permitted to be stored in and dispensed from tanks and containers meeting the require-

ments of Sections 2-2 and 4-2 of NFPA 30, *Flammable and Combustible Liquids Code*, as applicable, inside service station buildings. Tanks and containers that contain only crankcase drainings shall be considered to be containing Class IIIB liquids. (30A:2-3.4)

28-2.2.3.6 Tanks storing Class IIIB liquids inside service station buildings shall be permitted to be located at, below, or above grade provided that adequate drainage or containment is provided. (30A:2-3.4.1)

28-2.2.4 Aboveground Storage Tanks at Service Stations.

28-2.2.4.1* Except as modified by the provisions of this section, aboveground storage tanks shall comply with the applicable provisions in Chapters 2 and 3 of NFPA 30, *Flammable and Combustible Liquids Code*. (30A:2-4.1)

28-2.2.4.1.1 Only aboveground storage tanks shall be used. Tanks designed and built for underground use shall not be installed for aboveground use. (30A:2-4.1.1)

28-2.2.4.2 Tank Location and Capacity.

28-2.2.4.2.1 Tanks storing Class I and Class II liquids at an individual site shall be limited to a maximum individual capacity of 12,000 gal (45,600 L) and an aggregate capacity of 40,000 gal (152,000 L). Tanks storing Class II and Class IIIA liquids at a fleet vehicle service station shall be limited to a maximum individual fueling capacity of 20,000 gal (76,000 L) and an aggregate capacity of 80,000 gal (304,000 L). (30A:2-4.2.1)

28-2.2.4.2.2 Tanks shall be located at least

- (1) 50 ft (15 m) from the nearest important building on the same property;
- (2) 50 ft (15 m) from any fuel dispenser;
- (3) 50 ft (15 m) from the nearest side of a public way; and
- (4) 100 ft (30 m) from any property line that is or might be built upon, including the opposite side of a public way.

Exception No. 1: All distances shall be permitted to be reduced by 50 percent if the tanks are fire-resistant tanks, as defined in Section 1-2 of NFPA 30A, or are installed in vaults that comply with 28-2.2.4.4.

Exception No. 2: At commercial, industrial, governmental, or manufacturing establishments, where the tanks are intended for fueling vehicles used in connection with their business, no minimum distance shall be required by 28-2.2.4.2.2(2) if the tanks are fire-resistant tanks, as defined in Section 1-2 of NFPA 30A, or are installed in vaults that comply with 28-2.2.4.4. (30A:2-4.2.2)

28-2.2.4.3 Control of Spillage. Spill control shall be provided in accordance with 2-3.4 of NFPA 30, *Flammable and Combustible Liquids Code*.

Exception: Tanks installed in vaults that comply with 28-2.2.4.4 are not required to meet this requirement. (30A:2-4.3)

28-2.2.4.4 Vaults. Vaults shall be permitted to be either above or below grade and shall comply with the following:

- (1) The vault shall completely enclose each tank. There shall be no openings in the vault enclosure except those necessary for access to, inspection of, and filling, emptying, and venting of the tank. The walls and floor of the vault shall be constructed of reinforced concrete at least 6 in. (15 cm) thick. The top of an above-grade vault shall be constructed of noncombustible material and shall be designed to be weaker than the walls of the vault, to ensure that the thrust of any explosion occurring inside the vault is directed upward before significantly high

pressure can develop within the vault. The top of an at-grade or below-grade vault shall be designed to safely relieve or contain the force of any explosion occurring inside the vault. The top and floor of the vault and the tank foundation shall be designed to withstand the anticipated loading, including loading from vehicular traffic, where applicable. The walls and floor of any vault installed below grade shall be designed to withstand anticipated soil and hydrostatic loading. The vault shall be substantially liquidtight and there shall be no backfill around the tank. There shall be sufficient space between the tank and the vault to allow for inspection of the tank and its appurtenances.

- (2) Each vault and its tank shall be suitably anchored to withstand uplifting by groundwater or flooding, including when the tank is empty.
- (3) A vault shall be designed to be wind- and earthquake-resistant, in accordance with good engineering practice. The vault shall be resistant to damage from the impact of a motor vehicle, or suitable collision barriers shall be provided.
- (4) Each tank shall be in its own vault. Adjacent vaults may share a common wall.
- (5) Connections shall be provided to permit venting of each vault to dilute, disperse, and remove any vapors prior to personnel entering the vault.
- (6) Vaults that contain tanks of Class I liquids shall be provided with continuous ventilation at a rate of not less than 1 ft³ per min per ft² of floor area (0.3 m³ per min per m²), but not less than 150 cfm (4 m³ per min). Failure of the exhaust air flow shall automatically shut down the dispensing system. The exhaust system shall be designed to provide air movement across all parts of the vault floor. Supply and exhaust ducts shall extend to within 3 in. (7.6 cm), but not more than 12 in. (30 cm), of the floor. The exhaust system shall be installed in accordance with the provisions of NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids*. Means shall be provided to automatically detect any flammable vapors and to automatically shut down the dispensing system upon detection of such flammable vapors in the exhaust duct at a concentration of 25 percent of the lower flammable limit.
- (7) Each vault shall be equipped with a detection system capable of detecting liquids, including water, and of activating an alarm.
- (8) Means shall be provided to recover liquid from the vault. If a pump is used to meet this requirement, the pump shall not be permanently installed in the vault. Electric-powered portable pumps shall be suitable for use in Class I, Division 1 locations, as defined in NFPA 70, *National Electrical Code*.
- (9) Vent pipes that are provided for normal tank venting shall terminate at least 12 ft (3.6 m) above ground level.
- (10) Emergency vents shall be vapor tight and shall be permitted to discharge inside the vault. Long-bolt manhole covers shall not be permitted for this purpose.
- (11) Each vault shall be provided with a means for personnel entry. At each entry point, a warning sign indicating the need for procedures for safe entry into confined spaces shall be posted. Each entry point shall be secured against unauthorized entry and vandalism.
- (12) Each vault shall be provided with a suitable means to admit a fire suppression agent.

- (13) The interior of any vault containing a tank that stores a Class I liquid shall be designated a Class I, Division 1 location, as defined in NFPA 70, *National Electrical Code*. (30A:2-4.4)

28-2.2.4.5 Fire-Resistant Tanks. Fire-resistant tanks shall be listed for the use intended and shall comply with all of the following:

- (1) The construction that provides the required fire-resistive protection shall prevent release of liquid, failure of the primary tank, failure of the supporting structure, and impairment of venting for a period of not less than 2 hours when tested using a fire exposure that simulates a high-intensity pool fire, such as that described in UL 2085, *Standard for Insulated Aboveground Tanks for Flammable and Combustible Liquids*, or equivalent test procedure.
- (2) There shall be no openings except those necessary for access to, inspection of, filling, emptying, and venting of the tank. All openings shall be located in the top of the tank.
- (3) Each fire-resistant tank shall be suitably anchored to withstand uplifting by groundwater or flooding, including when the tank is empty.
- (4) Each fire-resistant tank shall be resistant to damage from impact of a motor vehicle or shall be protected by suitable collision barriers.
- (5) Vent pipes that are provided for normal tank venting shall terminate at least 12 ft (3.6 m) above ground level.
- (6) Paragraph 2-3.6.7 of NFPA 30, *Flammable and Combustible Liquids Code*, shall not be used to reduce the size of the emergency vent. (30A:2-4.5)

28-2.2.4.6 Piping and Ancillary Equipment.

28-2.2.4.6.1 Means shall be provided for determining the liquid level in each tank and this means shall be accessible to the delivery operator. Means shall be provided to sound an audible alarm when the liquid level in the tank reaches 90 percent of capacity. Means shall also be provided to automatically stop the flow of liquid into the tank when the liquid level in the tank reaches 95 percent of capacity. These provisions shall not restrict or interfere with the proper operation of either the normal vent or the emergency vent. (30A:2-4.6.1)

28-2.2.4.6.2 Fuel shall not be dispensed from the tank by either gravity flow or pressurization of the tank. Means shall be provided to prevent the release of liquid by siphon flow. (30A:2-4.6.2)

28-2.2.4.6.3 Where a tank is at an elevation that produces a gravity head on the dispensing device, the tank outlet shall be equipped with a device (such as a normally closed solenoid valve) that will prevent gravity flow from the tank to the dispenser. This device shall be located adjacent to and downstream of the outlet valve specified by Chapter 2 of NFPA 30, *Flammable and Combustible Liquids Code*. The device shall be installed and adjusted so that liquid cannot flow by gravity from the tank to the dispenser in the event of failure of the piping or hose when the dispenser is not in use. (30A:2-4.6.3)

28-2.2.4.6.4 If a submersible pump system is used, a listed emergency shutoff valve shall be installed at each dispensing device, as required by 28-2.4.3.5. (30A:2-4.6.4)

28-2.2.4.6.5 If a suction pump-type dispensing device is used, a listed, vacuum-actuated shutoff valve, with a shear section, or equivalent-type valve shall be installed directly under each dispensing device.

Exception: Tanks installed in below-grade vaults are not required to comply with this requirement. (30A:2-4.6.5)

28-2.2.4.6.6 Shutoff and check valves shall be equipped with a pressure-relieving device that will relieve the pressure generated by thermal expansion back to the tank. (30A:2-4.6.6)

28-2.2.4.6.7 Piping shall be routed so that exposure to physical damage is minimized. (30A:2-4.6.7)

28-2.2.4.7 Physical Protection.

28-2.2.4.7.1 Tanks not enclosed in vaults shall be enclosed with a chain link fence at least 6 ft (2 m) high. The fence shall be separated from the tanks by at least 10 ft (3 m) and shall have a gate that is secured against unauthorized entry. Aboveground tanks shall be resistant to damage from the impact of a motor vehicle or shall be protected by collision barriers.

Exception: Tanks are not required to be enclosed within a fence if the property on which the tanks are located already has a perimeter security fence. (30A:2-4.7.1)

28-2.2.4.7.2 The area within the fence and within any dike shall be kept free of vegetation, debris, and any other material that is not necessary to the proper operation of the tank and piping system. (30A:2-4.7.2)

28-2.2.4.8 Corrosion Protection. Any portion of a tank or its piping system that is in contact with the soil shall be protected from corrosion in accordance with sound engineering practice. (30A:2-4.8)

28-2.2.4.9 Tank Filling Operations.

28-2.2.4.9.1 Delivery operations shall comply with applicable requirements of NFPA 385, *Standard for Tank Vehicles for Flammable and Combustible Liquids*, and with the requirements of 28-2.2.4.9.2 through 28-2.2.4.9.4. (30A:2-4.9.1)

28-2.2.4.9.2 The delivery vehicle shall be separated from any aboveground tank by at least 25 ft (7.6 m).

Exception No. 1: No minimum separation distance shall be required for tanks that are filled by gravity.

Exception No. 2: The required minimum separation distance shall be permitted to be reduced to 15 ft (4.6 m) where the fuel being delivered is not a Class I liquid. (30A:2-4.9.2)

28-2.2.4.9.3 Tank filling shall not begin until the delivery operator has determined tank ullage (available capacity). (30A:2-4.9.3)

28-2.2.4.9.4 All tanks shall be filled through a liquid-tight connection. Where the tank is filled by means of fixed piping, either a check valve and shutoff valve with a quick-connect coupling or a check valve with a dry-break coupling shall be installed in the piping at a point where connection and disconnection is made between the tank and the delivery vehicle. This device shall be protected from tampering and physical damage. (30A:2-4.9.4)

28-2.3 Piping, Valves, and Fittings.

28-2.3.1 The design, fabrication, assembly, test, and inspection of the piping system shall be in accordance with Chapter 3 of NFPA 30, *Flammable and Combustible Liquids Code*, except that, where dispensing is from a floating structure, suitable lengths of oil-resistant flexible hose shall be permitted to be used between the shore piping and the piping on the floating structure as made necessary by change in water level or shoreline. (30A:3-1)

28-2.3.2 Where excessive stray currents are encountered, piping handling Class I and Class II liquids at marine service stations shall be electrically insulated from the shore piping. (30A:3-2)

28-2.3.3 Piping shall be located so as to be protected from physical damage. (30A:3-3)

28-2.3.4 A readily accessible valve to shut off the supply from shore shall be provided in each pipeline at or near the approach to the pier and at the shore end of each marine pipeline adjacent to the point where a flexible hose is attached. (30A:3-4)

28-2.3.5 Each fill pipe for liquid storage shall be identified by color code or other marking to identify the product for which the tank is used. The color code or marking shall be maintained in legible condition throughout the life of the tank installation. (30A:3-6)

28-2.3.6 Shutoff and check valves shall be equipped with a pressure-relieving device that will relieve any pressure generated by thermal expansion of the contained liquid back to the storage tank. (30A:3-7)

28-2.3.7 Piping components constructed of low melting point materials shall be permitted to be used without backfill in below-grade underground tank sumps. (30A:3-8)

28-2.4 Fuel Dispensing System.

28-2.4.1 Location of Dispensing Devices and Emergency Power Cutoff.

28-2.4.1.1 Dispensing devices at an automotive service station shall be so located that all parts of the vehicle being served will be on the premises of the service station. Openings beneath enclosures shall be sealed to prevent the flow of leaking fuel to lower building spaces.

Dispensing devices at marine service stations shall be permitted to be located on open piers, wharves, floating docks, or on shore, or on piers of the solid-fill type, and shall be located apart from other structures so as to provide room for safe ingress and egress of craft to be fueled. Dispensing devices shall be in all cases at least 20 ft (6 m) from any activity involving fixed sources of ignition. Dispensing devices located inside buildings shall comply with Chapter 6 of NFPA 30A. (30A:4-1.1)

28-2.4.1.2 A clearly identified and easily accessible switch(es) or circuit breaker(s) shall be provided at a location remote from dispensing devices, including remote pumping systems, to shut off the power to all dispensing devices in the event of an emergency. (See 28-2.8.4.5 and 28-2.8.5.3 for applicable requirements for proper location of the emergency controls.) (30A:4-1.2)

28-2.4.2 Fuel Dispensing Devices.

28-2.4.2.1 Class I liquids and Class II liquids shall be transferred from tanks by means of fixed pumps designed and equipped to allow control of the flow and prevent leakage or accidental discharge. (30A:4-2.1)

28-2.4.2.2 Dispensing devices for Class I liquids shall be listed. Existing listed or labeled dispensing devices shall be permitted to be modified provided that the modifications made are "Listed by Report" by an approved testing laboratory or as otherwise approved by the authority having jurisdiction. Modification proposals shall contain a description of the component parts used in the modification and the recommended methods of installation on specific dispensing devices, and they

shall be made available to the authority having jurisdiction upon request. (30A:4-2.2)

28-2.4.2.3 A control shall be provided that will permit the pump to operate only when a dispensing nozzle is removed from its bracket or normal position with respect to the dispensing device and the switch on this dispensing device is manually actuated. This control shall also stop the pump when all nozzles have been returned, either to their brackets or to the normal nondispensing position. (30A:4-2.3)

28-2.4.2.4 Liquids shall not be dispensed by applying pressure to drums, barrels, and similar containers. Listed pumps taking suction through the top of the container or listed self-closing faucets shall be used. (30A:4-2.4)

28-2.4.2.5 Dispensing devices, except those attached to containers, shall either be mounted on a concrete island or otherwise protected against collision damage by suitable means and shall be securely bolted in place. If located indoors, the dispensing device shall also be located in a position where it cannot be struck by a vehicle that is out of control descending a ramp or other slope. The installation shall be in accordance with the manufacturer's instructions. (30A:4-2.5)

28-2.4.2.6 Listed hose assemblies shall be used to dispense fuel. Hose length at automotive service stations shall not exceed 18 ft (5.5 m). Where hose length at marine service stations exceeds 18 ft (5.5 m), the hose shall be secured so as to protect it from damage. (30A:4-2.6)

28-2.4.2.7 A listed emergency breakaway device designed to retain liquid on both sides of the breakaway point shall be installed on each hose dispensing Class I liquids. Such devices shall be installed and maintained in accordance with the manufacturer's instructions.

Where hoses are attached to a hose-retrieving mechanism, the listed emergency breakaway device shall be installed between the point of attachment of the hose-retrieving mechanism to the hose and the hose nozzle valve.

Exception: Such devices shall not be required at marine service stations. (30A:4-2.7)

28-2.4.2.8 Dispensing devices used to fill portable containers with home heating fuels shall be located at least 20 ft (6 m) from any dispensing devices for Class I liquids. Dispensing devices for liquefied petroleum gas (LPG), liquefied natural gas (LNG), and compressed natural gas (CNG) shall also be located at least 20 ft (6 m) from any dispensing device for Class I liquids. (30A:4-2.8)

28-2.4.2.9 When maintenance to Class I dispensing devices becomes necessary and such maintenance might allow the accidental release or ignition of liquid, the following precautions shall be taken before such maintenance is begun:

- (1) Only persons knowledgeable in performing the required maintenance shall perform the work.
- (2) All electrical power to the dispensing devices, to the pump serving the dispensing devices, and to all associated control circuits shall be shut off at the main electrical disconnect panel.
- (3) The emergency shutoff valve at the dispenser, if installed, shall be closed.
- (4) All vehicle traffic and unauthorized persons shall be prevented from coming within 20 ft (6 m) of the dispensing device. (30A:4-2.9)

28-2.4.3 Remote Pumping Systems.

28-2.4.3.1 This section shall apply to systems for dispensing Class I liquids and Class II liquids where such liquids are transferred from storage to individual or multiple dispensing devices by pumps located other than at the dispensing devices. (30A:4-3.1)

28-2.4.3.2 Pumps shall be listed and designed or equipped so that no part of the system will be subjected to pressures above its allowable working pressure. (30A:4-3.2)

28-2.4.3.3 Each pump shall have installed on the discharge side a listed leak detection device that will provide an indication if the piping and dispensers are not essentially liquidtight. Each leak-detecting device shall be checked and tested at least annually according to the manufacturer's specifications to ensure proper installation and operation. (30A:4-3.3)

28-2.4.3.4 Pumps installed above grade, outside of buildings, shall be located not less than 10 ft (3 m) from lines of adjoining property that can be built upon and not less than 5 ft (1.5 m) from any building opening. Where an outside pump location is impractical, pumps shall be permitted to be installed inside buildings as provided for dispensers in 28-2.4.1 or in pits as provided in 4-3.5 of NFPA 30A, *Automotive and Marine Service Station Code*. Pumps shall be substantially anchored and protected against physical damage. (30A:4-3.4)

28-2.4.3.5 A rigidly anchored listed automatic emergency shutoff valve shall be installed in accordance with the manufacturer's instructions in each supply line at the base of each individual island-type dispenser or at the inlet of each overhead dispensing device. This valve shall incorporate a fusible link or other thermally actuated device that will close the valve in the event of fire exposure. This valve shall also incorporate a mechanism to close the valve in the event of severe impact or displacement of the dispenser. If the valve incorporates a shear section, the valve shall be rigidly anchored so that the shear section functions as intended. An emergency shutoff valve incorporating a slip-joint feature shall not be used. The automatic closing feature of this valve shall be checked at the time of initial installation and at least once a year thereafter by manually tripping the hold-open linkage. (30A:4-3.6)

28-2.4.4 Vapor Recovery Systems.

28-2.4.4.1 Dispensing devices incorporating provisions for vapor recovery shall be listed. (30A:4-4.1)

28-2.4.4.2 Hose nozzle valves used on vapor recovery systems shall be listed. (30A:4-4.2)

28-2.5 Service Stations Located Inside Buildings.

28-2.5.1 General.

28-2.5.1.1 A service station shall be permitted inside a building subject to approval of the authority having jurisdiction. (30A:6-1.1)

28-2.5.1.2 The service station shall be separated from other portions of the building by wall, partition, floor, or floor-ceiling assemblies having a fire resistance rating of not less than 2 hr. (30A:6-1.2)

28-2.5.1.3 Interior finish of service stations shall be constructed of noncombustible or approved limited-combustible materials. (30A:6-1.3)

28-2.5.1.4 Door and window openings in interior walls shall be provided with listed $1\frac{1}{2}$ -hr (B) fire doors. Doors shall be self-closing or shall be permitted to remain open during normal operations if they are designed to close automatically in a fire emergency by provision of listed closure devices. Fire doors shall be installed in accordance with NFPA 80, *Standard for Fire Doors and Fire Windows*. (30A:6-1.4)

28-2.5.1.5 Fire doors shall be kept unobstructed at all times. Appropriate signs and markings shall be used. (30A:6-1.5)

28-2.5.1.6 Openings in interior partitions and walls for ducts shall be protected by listed fire dampers. Openings in floor or floor-ceiling assemblies for ducts shall be protected with enclosed shafts. Enclosure of shafts shall be with wall or partition assemblies having a fire resistance rating of not less than 2 hr. Openings in enclosed shafts, for ducts, shall be protected with listed fire dampers. (30A:6-1.6)

28-2.5.2 Dispensing Area.

28-2.5.2.1 The dispensing area shall be located at street level, with no dispenser located more than 50 ft (15 m) from the vehicle exit to, or entrance from, the outside of the building. (30A:6-2.1)

28-2.5.2.2 Dispensing shall be limited to the area required to serve not more than four vehicles at one time.

Exception: At fleet vehicle service stations, where only Class II and Class III liquids are dispensed, the number of vehicles serviced at any one time shall be permitted to be increased to 12. (30A:6-2.2)

28-2.5.3 Ventilation.

28-2.5.3.1 Forced air heating, air conditioning, and ventilating systems serving the service station area shall not be interconnected with any such systems serving other parts of the building. Such systems shall be installed in accordance with the provisions of NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*. (30A:6-3.1)

28-2.5.3.2 A mechanical exhaust system shall be provided to serve only the dispensing area. This system shall be interlocked with the dispensing system such that air flow is established before any dispensing device can operate. Failure of air flow shall automatically shut down the dispensing system. (30A:6-3.2)

28-2.5.3.3 The exhaust system shall be designed to provide air movement across all portions of the dispensing area floor and to prevent the flow of flammable vapors beyond the dispensing area. Exhaust inlet ducts shall not be less than 3 in. (7.6 cm) nor more than 12 in. (0.30 m) above the floor. Exhaust ducts shall not be located in floors, or penetrate the floor of the dispensing area, and shall discharge to a safe location outside the building. (30A:6-3.3)

28-2.5.3.4 The exhaust system shall provide ventilation at a rate of not less than 1 cfm per ft² (0.3 m³ per min per m²) of dispensing area. (30A:6-3.4)

28-2.5.3.5 The exhaust system shall be installed in accordance with the provisions of NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids*. (30A:6-3.5)

28-2.5.3.6 The provisions of 28-2.5.3.2 through 28-2.5.3.5 shall not apply to a service station located inside a building if two or more sides of the dispensing area are open to the build-

ing exterior such that natural ventilation can normally be expected to dissipate flammable vapors. (30A:6-3.6)

28-2.5.4 Piping. All fuel and flammable vapor piping inside buildings but outside the service station area shall be enclosed within a horizontal chase or a vertical shaft used only for this piping. Vertical shafts and horizontal chases shall be constructed of materials having a fire resistance rating of not less than 2 hr. (30A:6-4.2)

28-2.5.5 Drainage Systems.

28-2.5.5.1 Floors shall be liquidtight. Emergency drainage systems shall be provided to direct flammable or combustible liquid leakage and fire protection water to a safe location. This might require curbs, scuppers, or special drainage systems. (30A:6-5.1)

28-2.5.5.2 Emergency drainage systems, if connected to public sewers or discharged into public waterways, shall be equipped with traps or separators. (30A:6-5.2)

28-2.6 Electrical Equipment. Where Class I liquids are stored, handled, or dispensed, electrical equipment shall meet the requirements of Chapter 7 of NFPA 30A, *Automotive and Marine Service Station Code*.

28-2.7 Heat-Producing Appliances.

28-2.7.1 Heat-producing appliances shall be permitted to be installed in a special room that is separated from an area that is classified as Division 1 or Division 2, in accordance with Table 7 of NFPA 30A, by walls that are constructed so as to prevent the transmission of vapors, that have a fire resistance rating of at least 1 hr, and that have no openings in the walls within 8 ft (2.4 m) of the floor that lead to a classified area. Specific small openings through the wall, such as for piping and electrical conduit, shall be permitted, provided the gaps and voids are filled with a fire-resistant material to resist transmission of vapors. This room shall not be used for storage of combustible material. All air for combustion purposes shall be taken from outside the building. (30A:8-3)

28-2.7.2 Heat-producing appliances using gas or oil fuel shall be permitted to be installed in the lubrication or service room where there is no dispensing or transferring of Class I liquids, including the open draining of automotive gasoline tanks, provided the bottom of the combustion chamber is at least 18 in. (46 cm) above the floor and the heat-producing appliances are protected from physical damage. (30A:8-4)

28-2.7.2.1 Solid fuel stoves shall not be permitted in any lubrication room or service room. (30A:8-4.1)

28-2.7.3 Heat-producing appliances using gas or oil fuel listed for use in garages shall be permitted to be installed in the lubrication or service room where Class I liquids are dispensed or transferred, provided the equipment is installed at least 8 ft (2.4 m) above the floor. (30A:8-5)

28-2.7.4 Electrical heat-producing appliances shall conform to Chapter 7 of NFPA 30A, *Automotive and Marine Service Station Code*. (30A:8-6)

28-2.8 Operational Requirements.

28-2.8.1 Fuel Delivery Nozzles.

28-2.8.1.1 A listed automatic-closing type hose nozzle valve, with or without latch-open device, shall be provided for the dispensing of motor fuels. (30A:9-1.1)

28-2.8.1.2 If a hose nozzle valve is provided with a latch-open device other than recommended by the valve manufacturer, the latch-open device shall be an integral part of the valve assembly, and such valve latch-open device combination shall meet the applicable requirements of UL 842, *Standard for Valves for Flammable Fluids*. (See also 28-2.8.4.4.) (30A:9-1.2)

28-2.8.1.3 At any installation where the normal flow of product may be stopped other than by the hose nozzle valve, such as at pre-pay stations, the system shall include listed equipment with a feature that causes or requires the closing of the hose nozzle valve before product flow can be resumed or before the hose nozzle valve can be replaced in its normal position in the dispenser; or the hose nozzle valve shall not be equipped with a latch-open device. (30A:9-1.2.1)

28-2.8.1.4 Overhead-type dispensing devices shall be provided with a listed automatic-closing type hose nozzle valve without a latch-open device.

Exception: A listed automatic-closing type hose nozzle valve with latch-open device shall be permitted to be used if the design of the system is such that the hose nozzle valve will close automatically in the event the valve is released from a fill opening or upon impact with a driveway. (30A:9-1.3)

28-2.8.1.5 Dispensing nozzles used at marine service stations shall be of the automatic-closing type without a latch-open device. (30A:9-1.4)

28-2.8.1.6 A hose nozzle valve used to dispense a liquid into a container shall be manually held open during the dispensing operation. (30A:9-1.5)

28-2.8.2 Dispensing into Portable Containers. No delivery of any Class I or Class II liquid shall be made into portable containers unless the container is constructed of metal or is approved by the authority having jurisdiction, has a tight closure, and is fitted with a spout or so designed that the contents can be poured without spilling. (See NFPA 30, *Flammable and Combustible Liquids Code*, 4-2.1, for further information.) (30A:9-2)

28-2.8.2.1 No sale or purchase of any Class I, Class II, or Class III liquids shall be made in containers unless such containers are clearly marked with the name of the product contained therein. (30A:9-2.1)

28-2.8.2.2* Portable containers of 12 gal (45 L) capacity or less shall not be filled while they are in or on a motor vehicle or marine craft. (30A:9-2.2)

28-2.8.3 Attendance or Supervision of Dispensing.

28-2.8.3.1 Each service station shall have an attendant or supervisor on duty whenever the station is open for business, who shall dispense liquids into fuel tanks or into containers, except as covered in 28-2.8.4 and 28-2.8.5. (30A:9-3.1)

28-2.8.3.2 Listed self-service dispensing devices are permitted at service stations provided that all dispensing of Class I liquids by a person other than the service station attendant is under the supervision and control of an attendant.

Exception: See 28-2.8.5. (30A:9-3.2)

28-2.8.3.3 The provisions of 28-2.2.1.1 shall not prohibit the temporary use of movable tanks in conjunction with the dispensing of flammable or combustible liquids into the fuel tanks of motor vehicles or other motorized equipment on premises not normally accessible to the public. Such installations shall only be made with the approval of the authority having

jurisdiction. The approval shall include a definite time limit. (30A:9-3.3)

28-2.8.3.4 The provisions of 28-2.2.1.1 shall not prohibit the dispensing of Class I and Class II liquids in the open from a tank vehicle to a motor vehicle located at commercial, industrial, governmental, or manufacturing establishments and intended for fueling vehicles used in connection with their businesses. Such dispensing shall be permitted provided

- (1) An inspection of the premises and operations has been made and approval granted by the authority having jurisdiction.
- (2) The tank vehicle complies with the requirements covered in NFPA 385, *Standard for Tank Vehicles for Flammable and Combustible Liquids*.
- (3) The dispensing hose does not exceed 50 ft (15 m) in length.
- (4) The dispensing nozzle is a listed automatic-closing type without a latch-open device.
- (5) Nighttime deliveries shall only be made in adequately lighted areas.
- (6) The tank vehicle flasher lights shall be in operation while dispensing.
- (7) Fuel expansion space shall be left in each fuel tank to prevent overflow in the event of temperature increase. (30A:9-3.4)

28-2.8.3.5 The provisions of 28-2.2.1.1 shall not prohibit the dispensing of Class I and Class II liquids in the open from a fuel dispensing system supplied by an existing aboveground tank, not to exceed 6000 gal (22,710 L), located at commercial, industrial, governmental, or manufacturing establishments, and intended for fueling vehicles used in connection with their business. Such dispensing shall be permitted provided:

- (1) An inspection of the premises and operations has been made and approval granted by the authority having jurisdiction.
- (2) The tank is safeguarded against collision, spillage, and overflow to the satisfaction of the authority having jurisdiction.
- (3) The tank system is listed or approved for such aboveground use.
- (4) The tank complies with requirements for emergency relief venting, the tank and dispensing system meet the electrical classification requirements of NFPA 30A, *Automotive and Marine Service Station Code*, and the tank complies with the provisions of 2-1.7 of NFPA 30A.
- (5) The tank storage shall comply with Chapter 2 of NFPA 30, *Flammable and Combustible Liquids Code*. (30A:9-3.5)

28-2.8.4 Attended Self-Service Stations.

28-2.8.4.1 Self-service station shall mean that portion of property where liquids used as motor fuels are stored and subsequently dispensed from fixed approved dispensing equipment into the fuel tanks of motor vehicles by persons other than the service station attendant and shall include facilities available for sale of other retail products. (30A:9-4.1)

28-2.8.4.2 Listed dispensing devices such as, but not limited to, coin-operated, card-operated, and remote-controlled types shall be permitted at self-service stations. (30A:9-4.2)

28-2.8.4.3 All attended self-service stations shall have at least one attendant on duty while the station is open for business. The attendant's primary function shall be to supervise,

observe, and control the dispensing of Class I liquids while said liquids are actually being dispensed. (30A:9-4.3)

28-2.8.4.4 The attendant shall be responsible for the following:

- (1) Prevent the dispensing of Class I liquids into portable containers not in compliance with 28-2.8.2
- (2) Prevent the use of hose nozzle valve latch-open devices that do not comply with 28-2.8.1.2
- (3) Control sources of ignition
- (4) Immediately activate emergency controls and handle accidental spills and fire extinguishers if needed

The attendant or supervisor on duty shall be mentally and physically capable of performing the functions and assuming the responsibility prescribed in 28-2.8.4.1 through 28-2.8.4.7. (30A:9-4.4)

28-2.8.4.5 Emergency controls specified in 28-2.4.1.2 shall be installed at a location acceptable to the authority having jurisdiction, but controls shall not be more than 100 ft (30 m) from dispensers. (30A:9-4.5)

28-2.8.4.6 Operating instructions shall be conspicuously posted in the dispensing area. (30A:9-4.6)

28-2.8.4.7 The dispensing area shall at all times be in clear view of the attendant, and the placing or allowing of any obstacle to come between the dispensing area and the attendant control area shall be prohibited. The attendant shall at all times be able to communicate with persons in the dispensing area. (30A:9-4.7)

28-2.8.5 Unattended Self-Service Stations.

28-2.8.5.1 Unattended self-service shall be permitted, subject to the approval of the authority having jurisdiction. (30A:9-5.1)

28-2.8.5.2 Listed dispensing devices shall be used. Coin- and currency-type devices shall only be permitted with the approval of the authority having jurisdiction. (30A:9-5.2)

28-2.8.5.3 Emergency controls specified in 28-2.4.1.2 shall be installed at a location acceptable to the authority having jurisdiction, but the controls shall be more than 20 ft (6 m) but less than 100 ft (30 m) from the dispensers. Additional emergency controls shall be installed on each group of dispensers or the outdoor equipment used to control the dispensers. Emergency controls shall shut off power to all dispensing devices at the station. Controls shall be manually reset only in a manner approved by the authority having jurisdiction. (30A:9-5.3)

28-2.8.5.4 Operating instructions shall be conspicuously posted in the dispensing area and shall include location of emergency controls and a requirement that the user shall stay outside of his/her vehicle, in view of the fueling nozzle during dispensing. (30A:9-5.4)

28-2.8.5.5 In addition to those warning signs specified in 28-2.8.9, emergency instructions shall be conspicuously posted in the dispenser area incorporating the following or equivalent wording:

Emergency Instructions
In case of fire or spill:

- (1) Use emergency stop button.
- (2) Report accident by calling (specify local fire number) on the phone. Report location. (30A:9-5.5)

28-2.8.5.6 A listed, automatic-closing-type hose nozzle valve with latch-open device shall be provided. The system shall include listed equipment with a feature that causes or requires

the closing of the hose nozzle valve before the product flow can be resumed or before the hose nozzle valve can be replaced in its normal position in the dispenser. (30A:9-5.6)

28-2.8.5.7 A telephone or other approved, clearly identified means to notify the fire department shall be provided on the site in a location approved by the authority having jurisdiction. (30A:9-5.7)

28-2.8.5.8 Additional fire protection shall be provided where required by the authority having jurisdiction. Additional fire protection considerations include such items as fixed suppression systems, automatic fire detection, manual fire alarm stations, transmission of alarms to off-site locations, and limiting gallonage delivered per transaction. (30A:9-5.8)

28-2.8.6 Drainage and Waste Disposal.

28-2.8.6.1 Provision shall be made in the area where Class I liquids are dispensed to prevent spilled liquids from flowing into the interior of service station buildings. Such provision shall be made by grading driveways, raising door sills, or other equally effective means. (30A:9-6.1)

28-2.8.6.2 Crankcase drainings and liquids shall not be dumped into sewers, streams, or upon the ground, but shall be stored in approved tanks or containers outside any building, or in tanks installed in accordance with Chapter 2 and Chapter 3 of NFPA 30A, until removed from the premises. (30A:9-6.2)

28-2.8.7 Sources of Ignition. In addition to the previously stated restrictions of this chapter, smoking materials, including matches and lighters, shall not be used within 20 ft (6 m) of areas used for fueling, servicing fuel systems for internal combustion engines, or receiving or dispensing of Class I liquids. Conspicuous and legible signs prohibiting smoking shall be posted within sight of the customer being served. The motors of all equipment being fueled shall be shut off during the fueling operation except for emergency generators, pumps, etc., where continuing operation is essential. (30A:9-7)

28-2.8.8 Fire Control.

28-2.8.8.1 Each service station shall be provided with one or more listed fire extinguishers that have a minimum capability of 40-B:C. They shall be located so that an extinguisher will be within 100 ft (30 m) of each pump, dispenser, underground fill pipe opening, and lubrication or service room. (30A:9-8)

28-2.8.8.2 Where required, automatic fire suppression systems shall be installed in accordance with appropriate NFPA standards, manufacturers' instructions, and the listing requirements of the systems. (*See Chapter 11 of NFPA 30A for referenced publications.*) (30A:9-8.1)

28-2.8.9 Signs. Warning signs shall be conspicuously posted in the dispensing area incorporating the following or equivalent wording:

- (1) WARNING — It is unlawful and dangerous to dispense gasoline into unapproved containers.
- (2) No Smoking
- (3) Stop Motor (30A:9-9)

28-3 Aircraft Fuel Servicing.

28-3.1 General.

28-3.1.1 Application.

28-3.1.1.1 Facilities and procedures for aircraft ground fuel servicing of all types of aircraft with liquid petroleum fuel shall

comply with this section and NFPA 407, *Standard for Aircraft Fuel Servicing*.

28-3.1.1.2 This section shall not apply to the following:

- (1) In-flight fueling
- (2) Fuel servicing of flying boats or amphibious aircraft on water
- (3) Draining or filling of aircraft fuel tanks incidental to aircraft fuel system maintenance operations or manufacturing

28-3.1.2 Fuel Servicing Personnel. Only authorized personnel trained in the safe operation of the equipment they use, in the operation of emergency controls, and in the procedures to be followed in an emergency shall fuel or defuel aircraft. (407:3-1.1)

28-3.1.3 Prevention and Control of Spills.

28-3.1.3.1 Fuel servicing equipment shall comply with the requirements of NFPA 407 and shall be maintained in safe operating condition. Leaking or malfunctioning equipment shall be removed from service. (407:3-2.1)

28-3.1.3.2 Fuel nozzles shall not be dragged along the ground. (407:3-2.2)

28-3.1.3.3 Pumps, either hand operated or power operated, shall be used where aircraft are fueled from drums. Pouring or gravity flow shall not be permitted from a container with a capacity of more than 5 gal (18.9 L). (407:3-2.3)

28-3.1.4 Bonding.

28-3.1.4.1 Prior to making any fueling connection to the aircraft, the fueling equipment shall be bonded to the aircraft by use of a cable, thus providing a conductive path to equalize the potential between the fueling equipment and the aircraft. The bond shall be maintained until fueling connections have been removed, thus allowing separated charges that could be generated during the fueling operation to reunite. (407:3-4.1)

28-3.1.4.2 In addition to the above, where fueling overwing, the nozzle shall be bonded with a nozzle bond cable having a clip or plug to a metallic component of the aircraft that is metallically connected to the tank filler port. The bond connection shall be made before the filler cap is removed. If there is no plug receptacle or means for attaching a clip, the operator shall touch the filler cap with the nozzle spout before removing the cap in order to equalize the potential between the nozzle and the filler port. The spout shall be kept in contact with the filler neck until the fueling is completed. (407:3-4.2)

28-3.1.4.3 Where a funnel is used in aircraft fueling, it shall be kept in contact with the filler neck as well as the fueling nozzle spout or the supply container to avoid the possibility of a spark at the fill opening. Only metal funnels shall be used. (407:3-4.3)

28-3.1.4.4 Where a hydrant servicer or cart is used for fueling, the hydrant coupler shall be connected to the hydrant system prior to bonding the fuel equipment to the aircraft. (407:3-4.4)

28-3.1.4.5 Bonding and fueling connections shall be disconnected in the reverse order of connection. (407:3-4.5)

28-3.1.4.6 Conductive hose shall be used to prevent electrostatic discharge but shall not be used to accomplish required bonding. (407:3-4.6)

28-3.1.5 Operation of Aircraft Engines and Heaters.

28-3.1.5.1 Fuel servicing shall not be performed on a fixed wing aircraft while an onboard engine is operating. (See Section 3-21 of NFPA 407.)

Exception: In an emergency resulting from the failure of an onboard auxiliary power unit on a jet aircraft and in the absence of suitable ground support equipment, a jet engine mounted at the rear of the aircraft or on the wing on the side opposite the fueling point shall be permitted to be operated during fueling to provide power, provided that the operation follows written procedures approved by the authority having jurisdiction. (407:3-5.1)

28-3.1.5.2 Combustion heaters on aircraft (e.g., wing and tail surface heaters, integral cabin heaters) shall not be operated during fueling operations. (407:3-5.2)

28-3.1.6 Internal Combustion Engine Equipment Around Aircraft (Other than Aircraft Fuel Servicing Vehicles).

28-3.1.6.1 Equipment, other than that performing aircraft servicing functions, shall not be permitted within 50 ft (15 m) of aircraft during fuel servicing operations. (407:3-6.1)

28-3.1.6.2 Equipment performing aircraft servicing functions shall not be positioned within a 10-ft (3-m) radius of aircraft fuel system vent openings. (407:3-6.2)

28-3.1.6.3 During overwing aircraft fuel servicing where aircraft fuel system vents are located on the upper wing surface, equipment shall not be positioned under the trailing edge of the wing. (407:3-6.3)

28-3.1.7 Open Flames.

28-3.1.7.1 Entrances to fueling areas shall be posted with "no smoking" signs. (407:3-8.1)

28-3.1.7.2 Open flames on aircraft fuel servicing ramps or aprons within 50 ft (15 m) of any aircraft fuel servicing operation or fueling equipment shall be prohibited. (407:3-8.2)

28-3.1.7.3 The category of open flames and lighted open-flame devices shall include, but shall not be limited to, the following:

- (1) Lighted cigarettes, cigars, pipes
- (2) Exposed flame heaters, liquid, solid, or gaseous devices, including portable and wheeled gasoline or kerosene heaters
- (3) Heat-producing, welding or cutting devices, and blow-torches
- (4) Flare pots or other open-flame lights (407:3-8.3)

28-3.1.7.4 Personnel shall not carry lighters or matches on their person while engaged in fuel servicing operations. (407:3-8.5)

28-3.1.7.5 Lighters or matches shall not be permitted on or in fueling equipment. (407:3-8.6)

28-3.1.7.6 The authority having jurisdiction shall be permitted to establish other locations where open flames and open-flame devices shall not be permitted. (407:3-8.4)

28-3.1.8 Aircraft Fuel Servicing Locations.

28-3.1.8.1 Aircraft fuel servicing shall be performed outdoors. Aircraft fuel servicing incidental to aircraft fuel system maintenance operations shall comply with the requirements of NFPA 410, *Standard on Aircraft Maintenance*. (407:3-10.1)

28-3.1.8.2 Aircraft being fueled shall be positioned so that aircraft fuel system vents or fuel tank openings are not closer than 25 ft (8 m) from any terminal building, hangar, service building, or enclosed passenger concourse other than a loading walkway. Aircraft being fueled shall not be positioned so that the vent or tank openings are within 50 ft (15 m) of any combustion and ventilation air-intake to any boiler, heater, or incinerator room. (407:3-10.2)

28-3.1.8.3 Accessibility to aircraft by emergency fire equipment shall be established for aircraft fuel servicing positions. (407:3-10.3)

28-3.2 Airport Fueling Systems.

28-3.2.1 Plans and Specifications. Work shall not be started on the construction or alteration of an airport fuel system until the design, plans, and specifications have been approved by the authority having jurisdiction. (407:2-4.1)

28-3.2.2 Acceptance Inspection. The authority having jurisdiction shall inspect and approve the completed system before it is put into service. (407:2-4.2)

28-3.2.3 Fuel Storage Tanks. The authority having jurisdiction shall determine the clearances required from runways, taxiways, and other aircraft movement and servicing areas to any aboveground fuel storage structure or fuel transfer equipment with due recognition given to national and international standards establishing clearances from obstructions. Tanks located in designated aircraft movement areas or aircraft servicing areas shall be underground or mounded over with earth. Vents from such tanks shall be constructed in a manner to preclude collision hazards with operating aircraft. Aircraft operators shall be consulted regarding the height and location of such vents to avoid venting flammable vapors in the vicinity of ignition sources, including operating aircraft and automotive equipment permitted in the area. (407:2-4.4.2)

28-3.3 Aircraft Fueling Ramp Drainage.

28-3.3.1 Application. Aircraft fueling ramp drainage shall comply with this section and NFPA 415, *Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways*.

28-3.3.2 Design.

28-3.3.2.1 Aircraft fueling ramps shall slope away from terminal buildings, aircraft hangars, aircraft loading walkways, or other structures, with a minimum grade of 1 percent (1:100) for the first 50 ft (15 m). Beyond this distance, the ramp slope to drainage inlets shall be permitted to be reduced to a minimum of 0.5 percent (1:200). (415:3-1.1)

28-3.3.2.2 Aircraft fueling ramp drainage as specified herein shall be accomplished by the provisions of 28-3.3.2.1 in conjunction with the following:

- (1) The use of drain inlets with connected piping
- (2) The use of open-grate trenches (415:3-1.2)

28-3.3.2.3 Drainage inlets, where provided, shall be located a minimum of 50 ft (15 m) from structures outlined in 28-3.3.2.1. (415:3-1.3)

28-3.3.2.4 The drainage system of any aircraft fueling ramp shall be so designed that the fuel or its vapor cannot enter into the drainage system of buildings, areas utilized for automobile parking, public or private streets, nor the public side of airport terminal or aircraft hangar structures. In no case shall the design allow fuel to collect on the aircraft fueling ramp or

adjacent ground surfaces where it could constitute a fire hazard. (415:3-1.4)

28-3.3.2.5 The final separator or interceptor for the entire airport drainage system shall be designed to allow disposal of combustible or flammable liquids into a safely located, approved containment facility. (415:3-1.5)

28-3.3.2.6 Grates and drain covers shall be removable to facilitate cleaning and flushing. (415:3-1.6)

28-3.3.2.7 If open-grate drainage trenches are used as a collection means, such open trenches, including branches, shall not be over 125 ft (38.1 m) in length with a minimum interval of 6 ft (1.8 m) between open-trench sections to act as fire stops. Each 125 ft (38.1 m) section shall be individually drained through underground piping. Open trenches shall not be used where they are in the line of pedestrian or passenger traffic. (415:3-1.7)

28-3.3.2.8 Underground piping and components used in drainage systems shall be noncombustible and inert to fuel. (415:3-1.8)

28-3.4 Fueling at Rooftop Heliports.

28-3.4.1 Application. Fueling at rooftop heliports shall comply with 28-3.4 of this document and Section 2-5 of NFPA 407, *Standard for Aircraft Fuel Servicing*.

28-3.4.2 Approval Required. Fueling on rooftop heliports shall be permitted only where approved by the authority having jurisdiction. (407:2-5)

28-3.4.3 General. Facilities for dispensing fuel with a flash point below 100° F (37.8°C) shall not be permitted at any rooftop heliport. (407:2-5.1.2)

28-3.4.4 Fueling Facilities.

28-3.4.4.1 The fuel storage system shall be located at or below ground level. (407:2-5.2.3)

28-3.4.4.2 Pumps shall be located at or below ground level. Relay pumping shall not be permitted. (407:2-5.3.1)

28-3.4.4.3 Pumps installed outside of buildings shall be located not less than 5 ft (1.5 m) from any building opening. They shall be substantially anchored and protected against physical damage from collision. (407:2-5.3.2)

28-3.4.5 Emergency Fuel Shutoff Stations.

28-3.4.5.1 A system shall be provided to completely shut off the flow of fuel in an emergency. The system shall shut off the fuel at the ground level. The emergency fuel shutoff controls shall be in addition to the normal operating controls for the pumps and deadman control. (407:2-5.9.1)

28-3.4.5.2 At least two emergency fuel shutoff stations located on opposite sides of the heliport at exitways or at similar locations shall be provided. An additional emergency fuel shutoff station shall be located at ground level and shall be near, but at least 10 ft (3 m) from, the pumps. (407:2-5.9.2)

28-3.4.5.3 Each emergency fuel shutoff station shall be placarded with words stating EMERGENCY FUEL SHUT-OFF in letters at least 2 in. (50 mm) high. The method of operation shall be indicated by an arrow or by the word PUSH or PULL, as appropriate. Any action necessary to gain access to the shutoff device (e.g., BREAK GLASS) shall be shown clearly. Lettering shall be of a color contrasting

sharply with the placard background for visibility. Placards shall be weather resistant, shall be conspicuously located, and shall be positioned so that they can be seen readily from a distance of at least 25 ft (7.6 m). (407:2-5.9.3)

28-3.4.6 Personnel Training. All heliport personnel shall be trained in the operation of emergency fuel shutoff controls and in the use of the available fire extinguishers. (407:2-5.11)

28-4 Marine Service Stations.

28-4.1 Application.

28-4.1.1 Facilities and procedures for the storage, handling, and dispensing of liquid fuels from equipment located on shore, or from equipment located on piers, wharves, or floating docks, into the fuel tanks of marine craft shall comply with this section and NFPA 30A, *Automotive and Marine Service Station Code*, except as covered in other NFPA standards.

28-4.1.2 This section shall not apply to the following:

- (1) Bulk plant or terminal, loading and unloading facilities
- (2) Transferring flammable or combustible liquids utilizing a flange-to-flange closed transfer piping system
- (3) Marine service stations where liquids used as fuels are stored and dispensed into the fuel tanks of marine craft of 300 gross tons (849 m³) or more (30A:10-1.2)

28-4.1.3 For the purpose of this section, the word “pier” shall also mean “dock,” “floating dock,” and “wharf.” (30A:10-1.3)

28-4.2 Storage.

28-4.2.1 Liquids shall be stored in one of the following:

- (1) Tanks located under ground as governed by Section 2-4 of NFPA 30, *Flammable and Combustible Liquids Code*
- (2) Tanks located above ground at marine service stations with the approval of the authority having jurisdiction and as provided for in Section 2-4 of NFPA 30A (30A:10-2.1.1)

28-4.2.2 Tanks supplying marine service stations and pumps not integral with the dispensing device shall be on shore or on a pier of the solid-fill type.

Exception: Where shore location would require excessively long supply lines to dispensers, tanks shall be permitted to be located on a pier, provided that applicable requirements of NFPA 30, Flammable and Combustible Liquids Code, Chapters 2 and 3, relative to spacing, diking, and piping, and Chapter 5, Table 5-9.5.3, relative to electrical classification, are met and the quantity so stored does not exceed 1100 gal (4164 L) aggregate capacity. (30A:10-2.1.2)

28-4.2.3 At marine service stations where a tank is at an elevation that produces a gravity head on the dispensing device, the tank outlet shall be equipped with a device (such as a normally closed solenoid valve) that will prevent gravity flow from the tank to the dispenser. This device shall be located adjacent to and downstream of the outlet valve specified by 2-3.8.1 of NFPA 30, *Flammable and Combustible Liquids Code*. The device shall be installed and adjusted so that liquid cannot flow by gravity from the tank to the dispenser in the event of failure of the piping or hose when the dispenser is not in use. (30A:10-2.1.3)

28-4.3 Piping Systems.

28-4.3.1 Piping shall be located so as to be protected from physical damage. (30A:10-3.1)

28-4.3.1.1 All piping systems shall be substantially supported and protected against physical damage and stresses arising

from impact, settlement, vibration, expansion, contraction, or tidal action. (30A:10-3.1.1)

28-4.3.1.2 A means shall be provided to ensure flexibility of the piping in event of motion of the pier. Flexible piping shall be of a type designed to withstand the forces and pressures exerted upon piping. (30A:10-3.1.2)

28-4.3.2 Suitable lengths of oil-resistant flexible hose shall be permitted to be employed between the shore piping and the piping on a floating structure to accommodate changes in water level or shoreline. (30A:10-3.2)

28-4.3.3 A readily accessible valve to shut off the liquid supply from shore shall be provided in each pipeline at or near the approach to the pier and at the shore end of each marine pipeline adjacent to the point where each flexible hose is attached. (30A:10-3.3)

28-4.3.4 Shutoff and check valves shall be equipped with a pressure-relieving device that will relieve any pressure generated by thermal expansion of the contained liquid back to the storage tank. (30A:10-3.4)

28-4.4 Fuel Dispensing Devices.

28-4.4.1 All hoses shall be listed. Where hose length at marine service stations exceeds 18 ft (5.5 m), the hose shall be secured so as to protect it from damage. (30A:10-4.1)

28-4.4.2 Dispensing nozzles used at marine service stations shall be of the automatic-closing type without a latch-open device. (30A:10-4.2)

28-4.4.3 Dispensing devices at marine service stations shall be permitted to be located on open piers, or on shore or on piers of the solid-fill type, and shall be located apart from other structures so as to provide room for safe ingress and egress of craft to be fueled. (30A:10-4.3)

28-4.4.4 Dispensing devices at marine service stations shall be located so as to minimize exposure to all other operational marina or pleasure boat berthing area facilities. Where tide and weather conditions permit, all liquid fuel handling shall be outside the main berthing areas. Inside marina or pleasure boat berthing areas, fueling facilities shall be so located that, in case of fire aboard a boat alongside, the danger to other boats near the facility will be minimal. No vessel or marine craft shall be made fast to or berthed at any fuel dispensing location except during fueling operations. (30A:10-4.4)

28-4.4.5 No vessel or marine craft shall be made fast to any other vessel or marine craft occupying a berth at a fuel dispensing location during fueling operations. (30A:10-4.5)

28-4.4.6 Apparatus dispensing Class I liquids into the fuel tanks of marine craft of the public shall not be located at a bulk plant unless separated by a fence or similar barrier from the area in which bulk operations are conducted. Above-ground tanks located at a bulk plant shall not be connected by piping to marine service station tanks. (30A:10-4.6)

28-4.4.7 Each marine service station shall have an attendant or supervisor on duty whenever the station is open for business. The attendant's primary function shall be to supervise, observe, and control the dispensing of liquids. (30A:10-4.7)

28-4.5 Sources of Ignition. All electrical components for dispensing liquids shall be installed in accordance with Chapter 7 of NFPA 30A.

- (1) All electrical equipment shall be installed and used in accordance with the requirements of NFPA 70, *National Electrical Code*, as it applies to wet, damp, and hazardous locations.
- (2) Clearly identified emergency switches readily accessible in case of fire or physical damage at any dispensing unit shall be provided on each marine wharf so interlocked as to shut off power to all pump motors from any individual location and to reset only from the master switch. Each such switch is to be identified by an approved sign stating EMERGENCY PUMP SHUTOFF in 2-in. (5-cm) red block capital letters.
- (3) All electrical wiring for power and lighting shall be installed on the side of the marine wharf opposite from the liquid piping system.
- (4) Smoking materials, including matches and lighters, shall not be used within 20 ft (6 m) of areas used for fueling, servicing fuel systems for internal combustion engines, or receiving or dispensing of Class I liquids. Conspicuous and legible signs prohibiting smoking shall be posted within sight of the customer being served. The motors of all equipment being fueled shall be shut off during the fueling operation, except for emergency generators, pumps, etc., where continuing operation is essential. (30A:10-6.1)

28-4.6 Grounding/Bonding.

28-4.6.1 Where excessive stray currents are encountered, piping handling Class I and Class II liquids at marine service stations shall be electrically isolated from the shore piping. (30A:10-7.1)

28-4.6.2* Pipelines on piers shall be adequately bonded and grounded. Bonding and grounding connections on all pipelines shall be located on the pier side of hose riser insulating flanges, if used, and shall be accessible for inspection. (30A:10-7.2)

28-4.6.3 The fuel delivery nozzle shall be put into contact with the vessel fill pipe before the flow of fuel shall commence and this bonding contact shall be continuously maintained until fuel flow has stopped to avoid possibility of electrostatic discharge. (30A:10-7.3)

28-4.7 Fire Control.

28-4.7.1 Each marine service station shall be provided with one or more listed fire extinguishers having a minimum classification of 40-B:C located so that an extinguisher will be within 100 ft (30 m) of each pump, dispenser, and pier-mounted liquid storage tank. (30A:10-8.1)

28-4.7.2 Piers that extend more than 500 ft (152 m) in travel distance from shore shall have a Class III standpipe installed in accordance with NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*. (30A:10-8.2)

28-4.7.3 Materials shall not be placed on a pier in such a manner as to obstruct access to fire-fighting equipment or important piping system control valves. Where the pier is accessible to vehicular traffic, an unobstructed roadway to the shore end of the wharf shall be maintained for access by fire-fighting apparatus. (30A:10-8.3)

28-4.8 Portable Tanks and Containers.

28-4.8.1 The provisions of 28-2.2.1.1 shall not prohibit the temporary use of movable tanks in conjunction with the dispensing of flammable or combustible liquids into the fuel

tanks of marine craft on premises not normally accessible to the public. Such installations shall only be made with the approval of the authority having jurisdiction. (30A:10-9.1)

28-4.8.2 No delivery of any Class I or Class II liquid shall be made into portable containers unless the container is constructed of metal or is approved by the authority having jurisdiction, has a tight closure, and is fitted with a spout or is so designed that the contents can be dispensed without spilling. (See NFPA 30, *Flammable and Combustible Liquids Code*, 4-2.1, for further information.) (30A:10-9.2)

28-4.8.3 Portable containers of 12 gal (45 L) capacity or less shall not be filled while they are in or on a marine craft. (30A:10-9.3)

28-4.9 Cargo Tank Fueling Facilities. The provisions of 28-4.2.1 shall not prohibit the dispensing of Class II liquids in the open from a tank vehicle to a marine craft located at commercial, industrial, governmental, or manufacturing establishments when the liquid is intended for fueling marine craft used in connection with their businesses. Such dispensing shall be permitted, provided that the following criteria are met:

- (1) An inspection of the premises and operations has been made and approval granted by the authority having jurisdiction.
- (2) The tank vehicle complies with the requirements of NFPA 385, *Standard for Tank Vehicles for Flammable and Combustible Liquids*.
- (3) The dispensing hose does not exceed 50 ft (15 m) in length.
- (4) The dispensing nozzle is a listed automatic-closing type without a latch open device.
- (5) Nighttime deliveries shall only be made in adequately lighted areas.
- (6) The tank vehicle flasher lights shall be in operation while dispensing.
- (7) Fuel expansion space shall be left in each fuel tank to prevent overflow in the event of temperature increase in accordance with 28-4.10.5. (30A:10-10.1)

28-4.10 General.

28-4.10.1 The following shall be the responsibility of the attendant:

- (1) Prevent the dispensing of Class I liquids into portable containers not in compliance with 28-2.8.2;
- (2) Be familiar with the dispensing mechanism and emergency shutoff controls;
- (3) Ensure that the vessel is properly moored and that all connections are made;
- (4) Be within 15 ft (4.6 m) of such dispensing controls during the fueling operation and maintain a direct clear unobstructed view of both the vessel fuel filler neck and the fueling facility emergency fuel shutoff mechanism. (30A:10-11.1)

28-4.10.2 Fueling shall not be undertaken at night except under well-lighted conditions. (30A:10-11.2)

28-4.10.3 During fueling operations smoking shall be forbidden on board the boat or vessel and on the dispensing site. (30A:10-11.3)

28-4.10.4 Before opening the tanks of the vessel to be fueled, the following precautions shall be taken:

- (1) All engines, motors, fans, and bilge blowers shall be shut down.
- (2) All open flames and smoking material shall be extinguished and all exposed heating elements shall be turned off.
- (3) Galley stoves shall be extinguished.
- (4) All ports, windows, doors, and hatches shall be closed. (30A:10-11.4)

28-4.10.5 The following shall occur after the flow of fuel has stopped:

- (1) The fill cap shall be tightly secured.
- (2) Any spillage shall be wiped up immediately.
- (3) If Class I liquid has been delivered, the entire vessel shall remain opened and bilge blowers turned on and allowed to run for at least 5 minutes before starting any engines or lighting galley fires. If bilge blowers are not available, an additional 5 minutes of ventilation shall be required. (30A:10-11.5)

28-4.10.6 No Class I liquids shall be delivered to any vessel having its tanks located below deck unless each tank is equipped with a separate fill pipe, the receiving end of which shall be securely connected to a deck plate and fitted with a screw cap. Such pipe shall extend to and into the tank. Vessels receiving Class II or Class IIIA combustible liquids shall have the receiving end of the fill pipe securely connected to a deck plate and fitted with a screw cap. Such pipe shall be permitted to connect to a manifold fuel fill system that shall extend to and into each separate tank. Each tank shall be provided with a suitable vent pipe that shall extend from the tank to the outside of the coaming or enclosed rails so that the vapors will dissipate outboard. (30A:10-11.6)

28-4.10.7 Vessel owners or operators shall not offer their craft for fueling unless the following criteria are met:

- (1) The tanks being filled are properly vented to dissipate vapors to the outside atmosphere and the fuel systems are liquidtight and vaportight with respect to all interiors.
- (2) All fuel systems are designed, installed, and maintained in compliance with the specifications of the manufacturer of the vessel.
- (3) Communication has been established between the fueling attendant and the person in control of the vessel receiving the fuel so as to determine the vessel's fuel capacity, the amount of fuel on board, and the amount of fuel to be taken on board.
- (4) The electrical bonding and grounding systems of the vessel have been maintained in accordance with the specifications of its manufacturer. (30A:10-11.7)

28-4.10.8 A suitable sign with the following legends printed in 2-in. (5-cm) red block capital letters on a white background shall be conspicuously posted at the dispensing area of all marine service stations:

BEFORE FUELING

- (1) Stop all engines and auxiliaries.
- (2) Shut off all electricity, open flames, and heat sources.
- (3) Check all bilges for fuel vapors.
- (4) Extinguish all smoking materials.
- (5) Close access fittings and openings that could allow fuel vapors to enter enclosed spaces of the vessel.

DURING FUELING

- (1) Maintain nozzle contact with fill pipe.
- (2) Wipe up spills immediately.
- (3) Avoid overfilling.
- (4) Fuel filling nozzle must be attended at all times.

AFTER FUELING

- (1) Inspect bilges for leakage and fuel odors.
- (2) Ventilate until odors are removed. (**30A:10-11.8**)

28-5 Alternate Fuels.

28-5.1 Fuel dispensing facilities for vehicles of all types using compressed natural gas shall comply with NFPA 52, *Compressed Natural Gas (CNG) Vehicular Fuel Systems Code*.

28-5.2* Fuel dispensing facilities for marine, highway, rail, off-road, and industrial vehicles using liquefied natural gas and LNG storage in ASME containers of 70,000 gal (265 m³) or less shall comply with NFPA 57, *Standard for Liquefied Natural Gas (LNG) Vehicular Fuel Systems*.

28-5.3 Fuel dispensing facilities for vehicles using liquefied petroleum gas (LPG) shall comply with NFPA 58, *Liquefied Petroleum Gas Code*.

Chapter 29 Safeguards During Building Construction, Alteration, and Demolition Operations

29-1 General Requirements.

29-1.1 Buildings undergoing construction, alteration, or demolition operations shall comply with this chapter and NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*.

29-1.2 A fire protection plan shall be established where required by the authority having jurisdiction.

29-1.3* In buildings under construction, adequate escape facilities shall be maintained at all times for the use of construction workers. Escape facilities shall consist of doors, walkways, stairs, ramps, fire escapes, ladders, or other approved means or devices arranged in accordance with the general principles of NFPA 101, *Life Safety Code*, insofar as they can reasonably be applied to buildings under construction. (101:4.6.10.2)

29-1.4 Where required by the authority having jurisdiction, a telephone shall be provided at the construction site for the purpose of emergency notification. The street address of the construction site and the emergency telephone number shall be posted adjacent to the telephone.

29-1.5 Temporary wiring shall comply with the provisions of Section 6-1 of this Code.

29-1.6 Cutting and welding shall comply with Chapter 18 of this Code.

29-2 Fire Safety During Construction.

29-2.1 Fire lanes provided in accordance with Section 3-5 of this Code shall be provided at the start of a project and shall be maintained throughout construction.

Exception: Permanent fire lane markings shall not be required until the building is complete or occupied for use.

29-2.2 In all buildings over one story in height, at least one stairway shall be provided that is in usable condition at all times and that meets the requirements of 7-2.2 of NFPA 101, *Life Safety Code*. This stairway shall be extended upward as each floor is installed in new construction and maintained for each floor still remaining during demolition. The stairway shall be lighted. During construction, the stairway shall be enclosed where the building exterior walls are in place. (241:5-4.8)

29-2.3 Water Supply.

29-2.3.1 A water supply for fire protection, either temporary or permanent, shall be made available as soon as combustible material accumulates. There shall be no delay in the installation of fire protection equipment. (See A-6-2.2 of NFPA 241.) (241:6-7.2.1)

29-2.3.2 Where underground water mains and hydrants are to be provided, they shall be installed, completed, and in service prior to construction work. (241:6-7.2.2)

29-2.4 In buildings required to be provided with a standpipe system in accordance with this Code, not less than one standpipe shall be provided and kept in service during construction. Such standpipes shall be installed when the progress of construction is not more than 50 ft (15 m) in height above grade. Standpipes shall be provided with approved fire department hose connections at accessible locations adjacent to

usable stairs and shall be designed to furnish 500 gal (1900 L) of water per minute at the top-most outlet at 65 psi (450 kPa). This standpipe shall be extended as construction progresses to within one floor of the highest point of construction having secured decking or flooring. If the standpipe is temporary, it shall be designed to furnish 100 gal (380 L) of water per minute at 65 psi (450 kPa) with a standpipe size of not less than 4 in. (10 cm) and shall remain in service until the permanent standpipe installation is complete.

29-2.5 The standpipes shall be provided with conspicuously marked and readily accessible fire department connections on the outside of the building at the street level and shall have at least one standard hose outlet at each floor level. (241:6-7.4.2.1)

29-2.6 A hose valve(s) shall have NH standard external threads for the valve size specified in accordance with NFPA 1963, *Standard for Fire Hose Connections*.

Exception: Where local fire department connections do not conform to NFPA 1963, the authority having jurisdiction shall designate the connection to be used. (241:6-7.4.2.5)

29-2.7 The suitability, distribution, and maintenance of extinguishers shall be in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*. (241:5-6.1)

29-2.8 At least one approved fire extinguisher also shall be provided in plain sight on each floor at each usable stairway as soon as combustible material accumulates. (241:5-6.3)

29-2.9 Suitable fire extinguishers shall be provided on self-propelled equipment. (241:5-6.4)

29-2.10 Smoking shall not be permitted, except in those areas approved by the authority having jurisdiction.

29-2.11 Accumulations of combustible waste material, dust, and debris shall be removed from the structure and its immediate vicinity at the end of each work shift or more frequently as necessary for safe operations. (241:3-4.1)

29-2.12 Rubbish shall not be burned on the premises without first obtaining a permit from the authority having jurisdiction. (241:3-4.2)

29-2.13 Materials susceptible to spontaneous ignition, such as oily rags, shall be stored in a listed disposal container. (241:3-4.3)

29-2.14 Scaffolding, Shoring, and Forms.

29-2.14.1 Accumulations of unnecessary combustible forms or form lumber shall be prohibited. Combustible forms or form lumber shall be brought into the structure only when needed. Combustible forms or form lumber shall be removed from the structure as soon as stripping is complete. Those portions of the structure where combustible forms are present shall not be used for the storage of other combustible building materials. (241:6-2.1)

29-2.14.2 During forming and stripping operations, portable fire extinguishers or charged hose lines shall be provided to protect the additional combustible loading adequately. (241:6-2.2)

29-2.15 Flammable and Combustible Liquids.

29-2.15.1 Storage of flammable and combustible liquids shall be in accordance with NFPA 30, *Flammable and Combustible Liquids Code*, except that storage of Class I and II liquids shall not exceed 60 gal (227 L) within 50 ft (15 m) of the structure. (241:3-5.1.1; 241:3-5.1.2)

29-2.15.2 Storage areas shall be kept free of weeds, debris, and combustible materials not necessary to the storage. (241:3-5.1.3)

29-2.15.3 Open flames and smoking shall not be permitted in flammable and combustible liquids storage areas. Such storage areas shall be appropriately posted as “no smoking” areas. (241:3-5.1.4)

29-2.15.4 Class I and Class II liquids shall be kept in approved safety containers. (241:3-5.2.1)

29-2.15.5 Class I liquids shall be dispensed only where there are no open flames or other sources of ignition within the possible path of vapor travel. (241:3-5.2.3)

29-2.16 Temporary Heating Equipment.

29-2.16.1 Temporary heating equipment shall be listed and shall be installed, used, and maintained in accordance with the manufacturer’s instructions. (241:3-2.1)

29-2.16.2 Chimney or vent connectors, where required from direct-fired heaters, shall be maintained at least 18 in. (457 mm) from combustibles and shall be installed in accordance with NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*. (241:3-2.2)

29-2.16.3 Oil-fired heaters shall comply in design and installation features with NFPA 31, *Standard for the Installation of Oil-Burning Equipment*. (241:3-2.3)

29-2.16.4 Fuel supplies for liquefied petroleum gas-fired heaters shall comply with NFPA 54, *National Fuel Gas Code*, and NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*. (241:3-2.4)

29-2.16.5 Refueling operations shall be conducted in an approved manner. (241:3-2.5)

29-2.16.6 Heating devices shall be situated so that they are secured and shall otherwise be installed in accordance with their listing, including clearance to combustible material, equipment, or construction. (241:3-2.6)

29-2.16.7 Temporary heating equipment, where utilized, shall be monitored for safe operation and maintained by properly trained personnel. (241:3-2.7)

29-2.16.8 Alteration of Buildings.

29-2.16.8.1 Where the building is protected by fire protection systems, such systems shall be maintained operational at all times during alteration.

Exception: Where alteration requires modification of a portion of the fire protection system, the remainder of the system shall be kept in service and the fire department shall be notified. When it is necessary to shut down the system, the authority having jurisdiction shall have the authority to require alternate measures of protection until the system is returned to service. The fire department shall be notified when the system is shut down and when the system is returned to service.

29-2.16.8.2 All required exit components shall be maintained in accordance with this Code as deemed necessary by the authority having jurisdiction.

29-2.16.8.3 Fire-resistive assemblies and construction shall be maintained.

29-3 Fire Safety During Demolition.

29-3.1 If a building intended to be demolished contains a sprinkler system, such system shall not be rendered inoperative without approval of the authority having jurisdiction.

29-3.2 Demolition operations involving the use of cutting and welding shall be done in accordance with Chapter 18 of this Code.

29-3.3 Combustible waste material shall not be burned at the demolition site unless approved by the authority having jurisdiction. Combustible materials shall be removed from the site as often as necessary to minimize the hazards therefrom.

29-3.4 Where in the opinion of the authority having jurisdiction the demolition site is of a hazardous nature, qualified personnel shall serve as an on-site fire watch.

29-3.5 Demolition Using Explosives. If explosives are used in demolition work (implosion), hose lines [at least two 1¹/₂-in. (38-mm) or one 2¹/₂-in. (65-mm)] shall be provided in the immediate vicinity of the demolition site during actual detonation. These lines shall be of sufficient length to be capable of extinguishing any small fire anywhere on the demolition site after detonation. (241:8-5)

29-4 Torch-Applied Roofing Systems.

29-4.1 Permits. Permits, where required, shall comply with Section 1-16.

29-4.2 Torch-applied roofing systems shall be installed in accordance with Chapter 7 of NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*.

29-5 Tar Kettles.

29-5.1 General.

29-5.1.1 The provisions of this section shall apply to any type of equipment including, but not limited to, chassis-mounted equipment used for preheating or heating tar, asphalt, pitch, or similar substances for roofs, floors, pipes, or similar objects.

29-5.1.2 Permits, where required, shall comply with Section 1-16.

29-5.1.3 Operating kettles shall not be located inside of or on the roof of any building.

29-5.1.4 The kettle shall be operated in a controlled area. The area shall be identified by the use of traffic cones, barriers, and other suitable means as approved by the authority having jurisdiction.

29-5.1.5 An operating kettle shall be attended by a minimum of one employee who is knowledgeable of the operations and hazards. The employee shall be within 25 ft (7.6 m) of the kettle and shall have the kettle within sight.

29-5.1.6 Two approved, 20-B:C fire extinguishers shall be provided and maintained within 25 ft (7.6 m) of the operating kettle. Fire extinguishers shall be mounted in an accessible and visible or identified location.

29-5.1.7 Roofing kettles shall not block exits, means of egress, gates, roadways, or entrances. Kettles shall not be closer than 10 ft (3 m) from exits or means of egress.

29-5.2 Fuel System.

29-5.2.1 Fuel containers shall be constructed and approved for the use for which they were designed.

29-5.2.2 LP-Gas containers, hose, regulators, and burners shall conform to the specifications in NFPA 58, *Liquefied Petroleum Gas Code*.

29-5.2.3 LP-Gas cylinders shall be secured to prevent accidental tipover.

29-5.2.4 LP-Gas cylinders, hose, regulators, and burners shall conform to the requirements of Chapter 21.

29-5.2.5 Regulators shall be required on any cylinders.

29-5.2.6 Where, in the opinion of the authority having jurisdiction, there is danger of physical damage to the container, protection shall be provided to prevent such physical damage.

29-5.2.7 LP-Gas containers for roofing kettles shall not be used in any building.

29-5.3 Maintenance.

29-5.3.1 Roofing kettles and all integral working parts shall be in good working condition and shall be maintained free of excessive residue.

29-5.3.2 All piping used for pumping heated material to the roof shall be installed in a manner to prevent loss of heated material.

29-5.3.3 Flexible steel piping shall not be used on the vertical extension of piping systems.

29-5.3.4 Flexible steel piping shall be limited to those connections that are immediately adjacent to the pump kettle or discharge outlet. No single length of flexible piping shall exceed 6 ft (1.8 m) in length, and all piping shall be able to withstand a pressure of at least four times the working pressure of the pump.

29-5.3.5 All roofing kettles shall have doors permanently attached. Doors shall be installed in a workmanlike manner and shall be provided with handles to provide opening without the operator having to stand in front of same.

29-5.3.6 All kettles shall have an approved, working visible temperature gauge that indicates the temperature of the material being heated.

29-5.3.7 All kettle doors shall be tightly closed and latched when in transit.

29-5.4 Construction. The materials and methods of construction of roofing kettles shall be acceptable to the authority having jurisdiction. The following are minimum requirements:

- (1) This section shall apply to all roofing kettles or tar pots in excess of 1 gal (3.8 L) capacity.
- (2) No roofing kettle shall have a capacity in excess of five barrels.
- (3) Roofing kettles of two-barrel capacity or less shall be constructed of steel sheet having a thickness of not less than 0.105 in. (No. 12 Manufacturers' Standard Gauge). Kettles of more than two-barrel capacity shall be constructed of steel sheet having a thickness of not less than 0.135 in. (No. 10 Manufacturers' Standard Gauge). All supports, corners, and the top and bottom of the fire box shall be bound with angle iron or other reinforcements approved by the authority having jurisdiction. All doors shall be hinged, closely fitted, and adequately latched. Fire boxes shall be of sufficient height from the ground or shall be provided with a system of shields or insulation to prevent heat damage to the street surface.
- (4) Lids that can be gravity operated shall be provided on all roofing kettles. The tops and covers of all kettles shall be constructed of steel sheet having a thickness of not less than 0.075 in. (No. 14 Manufacturers' Standard Gauge) that is close fitting and attached to the kettle with hinges that allow gravity to close the lid.
- (5) The chassis shall be substantially constructed and capable of carrying the load imposed upon it whether standing still or being transported.
- (6) Fuel containers, burners, and related appurtenances of roofing kettles in which liquefied petroleum gas is used for heating shall comply with all the requirements of NFPA 58, *Liquefied Petroleum Gas Code*.
- (7) Fuel containers that operate under air pressure shall not exceed 20 gal (76 L) in capacity and shall be subject to the approval of the authority having jurisdiction.
- (8) All fuel containers shall be maintained in accordance with applicable NFPA codes and standards or shall be at least 10 ft (3 m) from the burner flame or at least 2 ft (0.6 m) therefrom when properly insulated from heat or flame.

Chapter 30 Service Stations and Repair Garages

30-1 Service Stations.

30-1.1 Application.

30-1.1.1 Automotive service stations, marine service stations, service stations located inside buildings, and fleet vehicle service stations shall comply with this section and NFPA 30A, *Automotive and Marine Service Station Code*.

30-1.1.2 This chapter shall not apply to refueling operations. (For refueling operations, see Chapter 28.)

30-1.2 Service Stations, Pits, and Below-Grade and Sub-Floor Work Areas.

30-1.2.1 Walls, floors, and structural supports shall be constructed of masonry, concrete, or other suitable noncombustible materials. (30A:5-1.1)

30-1.2.2 In pits, below-grade work areas, and sub-floor work areas, the required number, location, and construction of means of egress shall comply with the provisions for special purpose industrial occupancies in Chapter 40 of NFPA 101, *Life Safety Code*. Stairs shall be noncombustible, slip-proof, and constructed with no accessible space underneath. (30A:5-1.2)

30-1.2.3 Pits, below-grade work areas, and sub-floor work areas shall be provided with exhaust ventilation at a rate of not less than 1 cfm/ft² (0.3 m³/min/m²) of floor area at all times that the building is occupied or when vehicles are parked in or over these areas. Exhaust air shall be taken from a point within 12 in. (0.3 m) of the floor of the pit, below-grade work area, or sub-floor work area. (30A:5-1.3)

30-2 Repair Garages.

30-2.1 Application. The construction and protection of, as well as the control of hazards in, garages used for major repair and maintenance of motorized vehicles and any sales and servicing facilities associated therewith shall comply with this section and NFPA 88B, *Standard for Repair Garages*.

30-2.2 Construction.

30-2.2.1 General Requirements. A repair garage shall not be located within or attached to a building or structure used for any purpose other than a repair garage unless separated by walls or partitions and floor or floor-ceiling assemblies having a fire resistance rating of not less than 2 hours. (88B:2-1.3)

30-2.2.2 Internal Subdivisions.

30-2.2.2.1 Any single area occupied for salesrooms, showrooms, offices, or similar spaces of 1500 ft² (139.4 m²) or more in area shall be separated from vehicle repair or parking areas by walls or partitions and floor or floor-ceiling assemblies having a fire resistance rating of not less than 2 hours. (88B:2-2.1)

30-2.2.2.2 Any single area occupied for salesrooms, showrooms, offices, or similar spaces of 1500 ft² (139.4 m²) or less in area shall be separated from vehicle repair or parking areas by walls or partitions and floor or floor-ceiling assemblies constructed in such a manner as to restrict the passage of smoke, vehicle exhaust gases, and odors from the repair or parking area to these spaces. (88B:2-2.2)

30-2.2.2.3 Parts storage areas exceeding 1500 ft² (139.4 m²) shall be separated from all other portions of the building by

walls or partitions and floor or floor-ceiling assemblies having a fire resistance rating of not less than 2 hours. (88B:2-2.3)

30-2.2.2.4 Garage occupancies shall be separated from other portions of a multitenanted building as required in 30-2.2.1. Heating equipment shall be separated or enclosed in accordance with 30-2.3.1.3. (88B:2-2.4)

30-2.2.3 Floors.

30-2.2.3.1 In areas of repair garages used for repair or servicing of vehicles, floor assemblies shall be constructed of noncombustible materials or, if combustible materials are used in the assembly, shall be surfaced with approved noncombustible material. Floors shall be liquidtight to prevent the leakage or seepage of liquids and shall be sloped to facilitate the movement of water, fuel, or other liquids to floor drains. (88B:2-3.1)

30-2.2.3.2 In areas of repair garages where motor fuels are dispensed or where vehicles are serviced, if floor drains are provided, they shall be properly trapped and shall discharge through an oil separator to the sewer or to an outside vented sump. (88B:2-3.2)

30-2.2.3.3 The contents of oil separators and traps of floor drainage systems shall be collected at sufficiently frequent intervals to prevent oil from being carried into the sewers. (88B:2-3.3)

30-2.2.4 Pits and Sub-Floor Work Areas. Pits and sub-floor work areas shall comply with the following:

- (1) Walls, floors, and piers shall be constructed of masonry, concrete, or other suitable noncombustible material.
- (2) Pits shall have a minimum of two unobstructed means of egress to prevent trapping of personnel in the event of fire. Steps shall be noncombustible, slip resistant, and constructed with no accessible storage space beneath.
- (3) Ventilation and drainage of pits and sub-floor work areas shall be in accordance with the provisions of 3-4.5 of NFPA 88B. (88B:2-7)

30-2.3 Hazards.

30-2.3.1 Heating.

30-2.3.1.1 Heating equipment shall be of an approved type. Improvised furnaces, salamanders, or space heaters shall not be permitted. (88B:3-2.1.1)

30-2.3.1.2 Heating equipment shall be installed to conform with NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*; NFPA 31, *Standard for the Installation of Oil-Burning Equipment*; NFPA 54, *National Fuel Gas Code*; NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*; and NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment*, as applicable, except as otherwise specifically provided in NFPA 88B, *Standard for Repair Garages*. (88B:3-2.1.4)

30-2.3.1.3 Heating equipment shall be installed in a detached building or room. It shall be separated from repair areas by walls or partitions and floor or floor-ceiling assemblies that are constructed so as to prohibit the transmission of vapors and having a fire resistance rating of not less than 1 hour, with no openings in the wall separating the repair area within 8 ft (2.4 m) of the floor. Wall penetrations shall be fire-stopped. Air for combustion purposes shall be obtained from outside the building. The heating room shall not be used for storage

of combustible materials, except for fuel storage as permitted by the standards referenced in 30-2.3.1.2.

Exception No. 1: Unit heaters, where installed in accordance with 3-2.3 of NFPA 88B. Ventilation requirements of 3-2.3 of NFPA 88B do not apply.

Exception No. 2: Heating equipment for vehicle repair areas where there is no dispensing or transferring of Class I or II flammable or combustible liquids, or liquefied petroleum gas, shall be installed in accordance with NFPA 30A, Automotive and Marine Service Station Code. (88B:3-2.2)

30-2.3.1.4 Approved suspended unit heaters shall be located not less than 8 ft (2.4 m) above the floor and installed in accordance with the conditions of their approval. (88B:3-2.3.1)

30-2.3.1.5 Return air openings in motor vehicle repair or parking areas shall be not less than 18 in. (0.5 m) above floor level measured to the bottom of the openings. (88B:3-2.4.1)

30-2.3.1.6 Recirculated air shall not be taken from any floors below grade level. (88B:3-2.4.2)

30-2.3.2 Ventilation.

30-2.3.2.1 Combined ventilation and heating systems shall not recirculate air from areas below grade level. (88B:3-3.2)

30-2.3.2.2 Below-grade areas occupied for repairing, or communicating areas located below a repair garage, shall be continuously ventilated by a mechanical ventilating system having positive means for exhausting indoor air at a rate of not less than 1 ft³/min/ft² (0.3 m³/min/m²) of floor area. An approved means shall be provided for introducing an equal amount of outdoor air. (88B:3-3.3)

30-2.3.2.3 Exhaust duct openings for required ventilation shall be so located as to effectively remove vapor accumulations at floor level from all parts of the repair area. (88B:3-3.4)

30-2.3.3 Repair Areas.

30-2.3.3.1 Pits so arranged that natural ventilation cannot be used shall be provided with an individual ventilating system capable of providing a complete air change every 5 minutes with the intake located near floor level. (88B:3-4.5.1)

30-2.3.3.2 Cleaning of parts shall be performed with a non-flammable solvent.

Exception: A combustible liquid with a flash point above 100° F (37.8° C) (closed cup) shall be permitted to be used for this purpose provided adequate ventilation is supplied and no sources of ignition are present in the cleaning area. (88B:3-4.7.1)

30-2.3.3.3 A device for heating solvents that give off flammable or toxic vapors when heated shall be provided with a limit control to prevent the solvent from exceeding a temperature

50°F (10°C) below the point at which flammable or toxic vapors are released. (88B:3-4.7.3)

30-2.3.3.4 Direct-fired parts cleaners shall not be installed or used below grade. (88B:3-4.7.4)

30-2.3.4 Housekeeping.

30-2.3.4.1 An authorized employee, an officer of the firm, or the owner shall make daily inspections of the garage and shall be responsible for the prompt removal or repair of any hazardous condition, including proper maintenance of equipment and safety devices and the immediate removal of accumulations of combustible materials. (88B:3-6.1)

30-2.3.4.2 Clear aisle space shall be maintained to permit ready access to and the use of fire-fighting equipment. (88B:3-6.2)

30-2.3.4.3 Floors shall be kept clean and free of oil and grease. Only approved water solutions or detergents, floor-sweeping compounds, and grease absorbents shall be used for cleaning floors. (88B:3-6.3)

30-2.3.4.4 Metal lockers shall be provided for employees' clothes. (88B:3-6.4)

30-2.3.4.5 Approved metal receptacles with self-closing covers shall be provided for the storage or disposal of oil-soaked waste or cloths. (88B:3-6.5)

30-2.3.4.6 Combustible rubbish shall be placed in covered metal receptacles until removed to a safe place for disposal. Contents of such containers shall be removed daily. (88B:3-6.6)

30-2.3.4.7 Smoking shall be prohibited except in designated areas subject to the approval of the authority having jurisdiction. (88B:3-6.7)

30-2.4 Protection.

30-2.4.1 Portable Fire Extinguishers. Approved extinguishers, installed and maintained in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*, shall be provided in all repair garages. (88B:4-3)

30-2.4.2 Standpipes. All repair garages that exceed a height of 50 ft (15 m), have parking levels below grade, or are unsprinklered and more than one story in height shall be provided with one or more standpipes conforming to the provisions of NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*. (88B:4-4)

30-2.4.3 Employee Instruction. Employees of all repair garages shall be instructed with respect to the importance of transmitting fire alarms promptly and shall be trained in the use of available private fire-fighting facilities. (88B:4-5)

Chapter 31 Grandstands and Bleachers, Folding and Telescopic Seating, Tents, and Membrane Structures

31-1 General.

31-1.1 The construction, location, protection and maintenance of grandstands and bleachers, folding and telescopic seating, tents and membrane structures shall meet the requirements of this chapter. Seating facilities located in the open air or within enclosed or semi-enclosed structures such as tents membrane structures and stadium complexes shall also meet the requirements of this chapter.

31-1.2 Permits. Permits, where required, shall comply with Section 1-16.

31-2 Permanent Membrane Structures.

31-2.1 General.

31-2.1.1 The provisions of Section 11.1 of NFPA 101 shall apply. (101:11.9.1.1)

31-2.1.2 Membrane materials shall not be used where fire resistance ratings are required for walls or roofs.

Exception No. 1: Where every part of the roof, including the roof membrane, is not less than 20 ft (6.1 m) above any floor, balcony, or gallery, a noncombustible or limited-combustible membrane shall be permitted to be used as the roof in any type of construction.

Exception No. 2: With approval of the authority having jurisdiction, membrane materials shall be permitted to be used where every part of the roof membrane is sufficiently above every significant fire potential that the imposed temperature cannot exceed the capability of the membrane, including seams, to maintain its structural integrity. (101:11.9.1.2)

31-2.1.3 Testing of membrane materials for compliance with Section 11.9 of NFPA 101 use of the categories of noncombustible and limited-combustible materials shall be performed on weathered-membrane material as defined in 3.3.211 of NFPA 101. (101:11.9.1.3)

31-2.1.4 Flame spread of all membrane materials exposed within the structure shall be Class A in accordance with Section 10.2 of NFPA 101. (101:11.9.1.4)

31-2.1.5 Roof membranes shall have a roof covering classification, as required by the applicable building codes, when tested in accordance with NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*. (101:11.9.1.5)

31-2.1.6 Flame Resistance.

31-2.1.6.1 All membrane structure fabric shall be flame resistant in accordance with 10.3.1 of NFPA 101. (101:11.9.1.6.1)

31-2.1.6.2 One of the following shall serve as evidence that the fabric materials have the required flame resistance:

- (1) The authority having jurisdiction shall require a certificate or other evidence of acceptance by an organization acceptable to the authority having jurisdiction.
- (2) The authority having jurisdiction shall require a report of tests made by other inspection authorities or organizations acceptable to the authority having jurisdiction. (101:11.9.1.6.2)

31-2.1.6.3 Where required by the authority having jurisdiction, confirmatory field tests shall be conducted using test specimens from the original material, which shall have been

affixed at the time of manufacture to the exterior of the structure. (101:11.9.1.6.3)

31-2.2 Tensioned-Membrane Structures.

31-2.2.1 The design, materials, and construction of the building shall be based on plans and specifications prepared by a licensed architect or engineer knowledgeable in tensioned-membrane construction. (101:11.9.2.1)

31-2.2.2 Material loads and strength shall be based on physical properties of the materials verified and certified by an approved testing laboratory. (101:11.9.2.2)

31-2.2.3 The membrane roof for structures in climates subject to freezing temperatures and ice buildup shall be composed of two layers with an air space between them through which heated air can be moved to guard against ice accumulation. As an alternative to the two layers, other approved methods that protect against ice accumulation shall be permitted. (101:11.9.2.3)

31-2.2.4 Roof drains shall be equipped with electrical elements to protect against ice buildup that can prevent the drains from functioning. Such heating elements shall be served by on-site standby electrical power in addition to the normal public service. As an alternative to such electrical elements, other approved methods that protect against ice accumulation shall be permitted. (101:11.9.2.4)

31-2.3 Air-Supported, Air-Inflated Structures.

31-2.3.1 General. In addition to the general provisions of Section 31-2, the requirements of 31-2.3 shall apply to air-supported structures. (101:11.9.3.1)

31-2.3.2 Pressurization (Inflation) System. The pressurization system shall consist of one or more operating blower units. The system shall include automatic control of auxiliary blower units to maintain the required operating pressure. This equipment shall meet the following requirements:

- (1) Blowers shall be powered by continuous-rated motors at the maximum power required.
- (2) Blowers shall have personnel protection, such as inlet screens and belt guards.
- (3) Blower systems shall be weather protected.
- (4) Blower systems shall be equipped with back-draft check dampers.
- (5) There shall be not less than two blower units, each of which has capacity to maintain full inflation pressure with normal leakage.
- (6) The blowers shall be designed to be incapable of over-pressurization.
- (7) The auxiliary blower unit(s) shall operate automatically if there is any loss of internal pressure or if an operating blower unit becomes inoperative.
- (8) The design inflation pressure and the capacity of each blower system shall be certified by a professional engineer. (101:11.9.3.2)

31-2.3.3 Standby Power System.

31-2.3.3.1 A fully automatic standby power system shall be provided. The system shall be either an auxiliary engine generator set capable of running the blower system or a supplementary blower unit that is sized for 1 times the normal operating capacity and is powered by an internal combustion engine. (101:11.9.3.3.1)

31-2.3.3.2 The standby power system shall be fully automatic to ensure continuous inflation in the event of any failure of the primary power. This system shall be capable of operating continuously for a minimum of 4 hours. (101:11.9.3.3.2)

31-2.3.3.3 The sizing and capacity of the standby power system shall be certified by a professional engineer. (101:11.9.3.3.3)

31-2.4 Maintenance and Operation.

31-2.4.1 Instructions in both operation and maintenance shall be transmitted to the owner by the manufacturer of the tensioned-membrane, air-supported, or air-inflated structure. (101:11.9.4.1)

31-2.4.2 An annual inspection and required maintenance of each structure shall be performed to ensure safety conditions. At least biennially, the inspection shall be performed by a professional engineer, registered architect, or individual certified by the manufacturer. (101:11.9.4.2)

31-2.5 Services.

31-2.5.1 Fired Heaters.

31-2.5.1.1 Only labeled heating devices shall be used. (101:11.9.5.1.1)

31-2.5.1.2 Fuel-fired heaters and their installation shall be approved by the authority having jurisdiction. (101:11.9.5.1.2)

31-2.5.1.3 Containers for liquefied petroleum gases shall be installed not less than 5 ft (1.5 m) from any temporary membrane structure and shall be in accordance with the provisions of NFPA 58, *Liquefied Petroleum Gas Code*. (101:11.9.5.1.3)

31-2.5.1.4 Tanks shall be secured in the upright position and protected from vehicular traffic. (101:11.9.5.1.4)

31-2.5.2 Electric Heaters.

31-2.5.2.1 Only labeled heaters shall be permitted. (101:11.9.5.2.1)

31-2.5.2.2 Heaters shall be connected to electricity by electric cable that is suitable for outside use and is of sufficient size to handle the electrical load. (101:11.9.5.2.2)

31-3 Temporary Membrane Structures.

31-3.1 General.

31-3.1.1 The provisions of Section 11.1 of NFPA 101 shall apply. (101:11.10.1.1)

31-3.1.2 Membrane structures designed to meet all the requirements of Section 31-3 shall be permitted to be used as temporary buildings subject to the approval of the authority having jurisdiction. (101:11.10.1.2)

31-3.1.3 Temporary tensioned-membrane structures shall be permitted to comply with Section 31-4 instead of Section 31-3. (101:11.10.1.3)

31-3.1.4 Roof membranes shall have a roof covering classification, as required by the applicable building codes, when tested in accordance with NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*. (101:11.10.1.4)

31-3.1.5 Flame Resistance.

31-3.1.5.1 All membrane structure fabric shall be flame resistant in accordance with 10.3.1 of NFPA 101. (101:11.10.1.5.1)

31-3.1.5.2 One of the following shall serve as evidence that the fabric materials have the required flame resistance:

- (1) The authority having jurisdiction shall require a certificate or other evidence of acceptance by an organization acceptable to the authority having jurisdiction.
- (2) The authority having jurisdiction shall require a report of tests made by other inspection authorities or organizations acceptable to the authority having jurisdiction. (101:11.10.1.5.2)

31-3.1.5.3 Where required by the authority having jurisdiction, confirmatory field tests shall be conducted using test specimens from the original material, which shall have been affixed at the time of manufacture to the exterior of the structure. (101:11.10.1.5.3)

31-3.2 Fire Hazards.

31-3.2.1 The ground enclosed by any temporary membrane structure, and the ground for a reasonable distance but for not less than 10 ft (3 m) outside of such a structure(s), shall be cleared of all flammable or combustible material or vegetation. This work shall be accomplished to the satisfaction of the authority having jurisdiction prior to the erection of such a structure(s). The premises shall be kept free from such flammable or combustible materials during the period for which the premises are used by the public.

Exception: Removal of flammable or combustible material shall not apply to areas used for necessary support equipment. (101:11.10.2.1)

31-3.2.2 Where prohibited by the authority having jurisdiction, smoking shall not be permitted in any temporary membrane structure. (101:11.10.2.2)

31-3.3 Fire Extinguishing Equipment. Portable fire-extinguishing equipment of approved types shall be furnished and maintained in temporary membrane structures in such quantity and in such locations as directed by the authority having jurisdiction. (101:11.10.3)

31-3.4 Tensioned Membrane Structures.

31-3.4.1 The design, materials, and construction of the building shall be based on plans and specifications prepared by a licensed architect or engineer knowledgeable in tension-membrane construction. (101:11.10.4.1)

31-3.4.2 Material loads and strength shall be based on physical properties of the materials verified and certified by an approved testing laboratory. (101:11.10.4.2)

31-3.4.3 The membrane roof for structures in climates subject to freezing temperatures and ice buildup shall be composed of two layers with an air space between them through which heated air can be moved to guard against ice accumulation. As an alternative to the two layers, other approved methods that protect against ice accumulation shall be permitted. (101:11.10.4.3)

31-3.4.4 Roof drains shall be equipped with electrical elements to protect against ice buildup that can prevent the drains from functioning. Such heating elements shall be served by on-site standby electrical power in addition to the normal public service. As an alternative to such electrical elements, other approved methods that protect against ice accumulation shall be permitted. (101:11.10.4.4)

31-3.5 Air-Supported, Air-Inflated Structures.

31-3.5.1 General. In addition to the general provisions of 31-3.1, the requirements of 31-3.5 shall apply to air-supported structures. (*101:11.10.5.1*)

31-3.5.2 Pressurization (Inflation) System. The pressurization system shall consist of one or more operating blower units. The system shall include automatic control of auxiliary blower units to maintain the required operating pressure. This equipment shall meet the following requirements:

- (1) Blowers shall be powered by continuous-rated motors at the maximum power required.
- (2) Blowers shall have personnel protection, such as inlet screens and belt guards.
- (3) Blower systems shall be weather protected.
- (4) Blower systems shall be equipped with back-draft check dampers.
- (5) There shall be not less than two blower units, each of which has capacity to maintain full inflation pressure with normal leakage.
- (6) The blowers shall be designed to be incapable of over-pressurization.
- (7) The auxiliary blower unit(s) shall operate automatically if there is any loss of internal pressure or if an operating blower unit becomes inoperative.
- (8) The design inflation pressure and the capacity of each blower system shall be certified by a professional engineer. (*101:11.10.5.2*)

31-3.5.3 Standby Power System.

31-3.5.3.1 A fully automatic standby power system shall be provided. The system shall be either an auxiliary engine generator set capable of running the blower system or a supplementary blower unit that is sized for 1 times the normal operating capacity and is powered by an internal combustion engine. (*101:11.10.5.3.1*)

31-3.5.3.2 The standby power system shall be fully automatic to ensure continuous inflation in the event of any failure of the primary power. This system shall be capable of operating continuously for a minimum of 4 hours. (*101:11.10.5.3.2*)

31-3.5.3.3 The sizing and capacity of the standby power system shall be certified by a professional engineer. (*101:11.10.5.3.3*)

31-3.6 Maintenance and Operation.

31-3.6.1 Instructions in both operation and maintenance shall be transmitted to the owner by the manufacturer of the tensioned-membrane, air-supported, or air-inflated structure. (*101:11.10.6.1*)

31-3.6.2 An annual inspection and required maintenance of each structure shall be performed to ensure safety conditions. At least biennially, the inspection shall be performed by a professional engineer, registered architect, or individual certified by the manufacturer. (*101:11.10.6.2*)

31-3.7 Services.

31-3.7.1 Fired Heaters.

31-3.7.1.1 Only labeled heating devices shall be used. (*101:11.10.7.1.1*)

31-3.7.1.2 Fuel-fired heaters and their installation shall be approved by the authority having jurisdiction. (*101:11.10.7.1.2*)

31-3.7.1.3 Containers for liquefied petroleum gases shall be installed not less than 5 ft (1.5 m) from any temporary membrane structure and shall be in accordance with the provisions of NFPA 58, *Liquefied Petroleum Gas Code*. (*101:11.10.7.1.3*)

31-3.7.1.4 Tanks shall be secured in the upright position and protected from vehicular traffic. (*101:11.10.7.1.4*)

31-3.7.2 Electric Heaters.

31-3.7.2.1 Only labeled heaters shall be permitted. (*101:11.10.7.2.1*)

31-3.7.2.2 Heaters used inside a temporary membrane structure shall be approved. (*101:11.10.7.2.2*)

31-3.7.2.3 Heaters shall be connected to electricity by electric cable that is suitable for outside use and is of sufficient size to handle the electrical load. (*101:11.10.7.2.3*)

31-4 Tents.

31-4.1 General.

31-4.1.1 The provisions of Section 11.1 of NFPA 101 shall apply. (*101:11.11.1.1*)

31-4.1.2 Tents shall be permitted only on a temporary basis. (*101:11.11.1.2*)

31-4.1.3 Tents shall be erected to cover not more than 75 percent of the premises, unless otherwise approved by the authority having jurisdiction. (*101:11.11.1.3*)

31-4.2 Flame Resistance.

31-4.2.1 All tent fabric shall be flame resistant in accordance with 10.3.1 of NFPA 101. (*101:11.11.2.1*)

31-4.2.2 One of the following shall serve as evidence that the tent fabric materials have the required flame resistance:

- (1) The authority having jurisdiction shall require a certificate or other evidence of acceptance by an organization acceptable to the authority having jurisdiction.
- (2) The authority having jurisdiction shall require a report of tests made by other inspection authorities or organizations acceptable to the authority having jurisdiction. (*101:11.11.2.2*)

31-4.2.3 Where required by the authority having jurisdiction, confirmatory field tests shall be conducted using test specimens from the original material, which shall have been affixed at the time of manufacture to the exterior of the tent. (*101:11.11.2.3*)

31-4.3 Location and Spacing.

31-4.3.1 There shall be a minimum of 10 ft (3 m) between stake lines. (*101:11.11.3.1*)

31-4.3.2 Adjacent tents shall be spaced to provide an area to be used as a means of emergency egress. Where 10 ft (3 m) between stake lines does not meet the requirements for means of egress, the distance necessary for means of egress shall govern.

Exception No. 1: Tents not occupied by the public and not used for the storage of combustible material shall be permitted to be erected less than 10 ft (3 m) from other structures where the authority having jurisdiction deems such close spacing safe from hazard to the public.

Exception No. 2: Tents, each not exceeding 1200 ft² (111.5 m²) in ground area and located in fairgrounds or similar open spaces, shall not be required to be separated from each other, provided that safety pre-

cautions meet the approval of the authority having jurisdiction. (101:11.11.3.2)

31-4.3.3 The placement of tents relative to other structures shall be at the discretion of the authority having jurisdiction, with consideration given to occupancy, use, opening, exposure, and other similar factors. (101:11.11.3.3)

31-4.4 Fire Hazard.

31-4.4.1 The ground enclosed by any tent, and the ground for a reasonable distance but for not less than 10 ft (3 m) outside of such a tent(s), shall be cleared of all flammable or combustible material or vegetation. This work shall be accomplished to the satisfaction of the authority having jurisdiction prior to the erection of such a tent(s). The premises shall be kept free from such flammable or combustible materials during the period for which the premises are used by the public.

Exception: Removal of flammable or combustible material shall not apply to areas used for necessary support equipment. (101:11.11.4.1)

31-4.4.2 Where prohibited by the authority having jurisdiction, smoking shall not be permitted in any tent. (101:11.11.4.2)

31-4.5 Fire Extinguishing Equipment. Portable fire-extinguishing equipment of approved types shall be furnished and maintained in tents in such quantity and in such locations as directed by the authority having jurisdiction. (101:11.11.5)

31-4.6 Services.

31-4.6.1 Fired Heaters.

31-4.6.1.1 Only labeled heating devices shall be used. (101:11.11.6.1.1)

31-4.6.1.2 Fuel-fired heaters and their installation shall be approved by the authority having jurisdiction. (101:11.11.6.1.2)

31-4.6.1.3 Containers for liquefied petroleum gases shall be installed not less than 5 ft (1.5 m) from any tent and shall be in accordance with the provisions of NFPA 58, *Liquefied Petroleum Gas Code*. (101:11.11.6.1.3)

31-4.6.1.4 Tanks shall be secured in the upright position and protected from vehicular traffic. (101:11.11.6.1.4)

31-4.6.2 Electric Heaters.

31-4.6.2.1 Only labeled heaters shall be permitted. (101:11.11.6.2.1)

31-4.6.2.2 Heaters used inside a tent shall be approved. (101:11.11.6.2.2)

31-4.6.2.3 Heaters shall be connected to electricity by electric cable that is suitable for outside use and is of sufficient size to handle the electrical load. (101:11.11.6.2.3)

31-5 New Grandstands.

31-5.1 General. Grandstands shall comply with the provisions of Chapter 12 of NFPA 101 as modified by Section 31-5 of this Code. (101:12.4.8.1)

31-5.2 Seating.

31-5.2.1 Where grandstand seating without backs is used indoors, rows of seats shall be spaced not less than 22 in. (55.9 cm) back-to-back. (101:12.4.8.2.1)

31-5.2.2 The depth of footboards and seat boards in grandstands shall be not less than 9 in. (22.9 cm). Where the same level is not used for both seat foundations and footrests, footrests independent of seats shall be provided. (101:12.4.8.2.2)

31-5.2.3 Seats and footrests of grandstands shall be supported securely and fastened in such a manner that they cannot be displaced inadvertently. (101:12.4.8.2.3)

31-5.2.4 Individual seats or chairs shall be permitted only if secured in rows in an approved manner, unless seats do not exceed 16 in number and are located on level floors and within railed-in enclosures, such as boxes. (101:12.4.8.2.4)

31-5.3 Special Requirements, Wood Grandstands.

31-5.3.1 An outdoor wood grandstand shall be erected within not less than two-thirds of its height and, in no case, within not less than 10 ft (3 m) of a building.

Exception No. 1: The distance requirement shall not apply for buildings of not less than 1-hour fire resistance-rated construction with openings protected against the fire exposure hazard created by the grandstand.

Exception No. 2: The distance requirement shall not apply where a wall of not less than 1-hour fire resistance-rated construction separates such a grandstand from the building. (101:12.4.8.3.1)

31-5.3.2 An outdoor wood grandstand unit shall not exceed 10,000 ft² (929 m²) in ground area or 200 ft (61 m) in length. Grandstand units of the maximum size shall be placed not less than 20 ft (6.1 m) apart or shall be separated by walls of 1-hour fire resistance rating. The number of such units erected in any one group shall not exceed three. Each group shall be separated from any other group by a wall of 2-hour fire resistance-rated construction extending 2 ft (0.6 m) above the seat platforms or by an open space of not less than 50 ft (15.2 m).

Exception: Where entirely constructed of labeled fire-retardant-treated wood that has passed the standard rain test, ASTM D 2898, Test Method for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing, or where constructed of members conforming to dimensions for heavy timber construction (Type IV (2HH)), the ground area or length shall be permitted to be doubled. (101:12.4.8.3.2)

31-5.3.3 The highest level of seat platforms above the ground or the surface at the front of the grandstand for any wood grandstand shall not exceed 20 ft (6.1 m). For portable grandstands within tents or membrane structures, the highest level shall not exceed 12 ft (3.7 m).

Exception: Where entirely constructed of labeled fire-retardant-treated wood that has passed the standard rain test, ASTM D 2898, Test Method for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing, or where constructed of members conforming to dimensions for heavy timber construction (Type IV (2HH)), the height shall be permitted to be doubled. (101:12.4.8.3.3)

31-5.4 Special Requirements, Portable Grandstands.

31-5.4.1 Portable grandstands shall conform to the requirements of Section 31-5 for grandstands and the requirements of 31-5.4.2 and 31-5.4.3. (101:12.4.8.4.1)

31-5.4.2 Portable grandstands shall be self-contained and shall have within them all necessary parts to withstand and restrain all forces that might be developed during human occupancy. They shall be designed and manufactured so that if any structural members essential to the strength and stability of the structure have been omitted during erection, the presence of unused connection fittings shall make the omissions self-evident. The

construction shall be skillfully accomplished to produce the strength required by the design. (101:12.4.8.4.2)

31-5.4.3 Portable grandstands shall be provided with base plates, sills, floor runners, or sleepers of such area that the permitted bearing capacity of the supporting material is not exceeded. Where portable grandstands rest directly on a base of such character that it is incapable of supporting the load without appreciable settlement, mud sills of suitable material, having sufficient area to prevent undue or dangerous settlement, shall be installed under base plates, runners, or sleepers. All bearing surfaces shall be in contact with each other. (101:12.4.8.4.3)

31-5.5 Spaces Underneath Grandstands. Spaces underneath a grandstand shall be kept free of flammable or combustible materials, unless protected by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101.

Exception No. 1: This requirement shall not apply to accessory uses of 300 ft² (28 m²) or less in area where of noncombustible or fire-resistive construction, such as ticket booths, toilet facilities, or concession booths, in otherwise nonsprinklered facilities.

Exception No. 2: This requirement shall not apply to rooms enclosed in not less than 1-hour fire resistance-rated construction that are less than 1000 ft² (93 m²) in area in otherwise nonsprinklered facilities. (101:12.4.8.5)

31-5.6 Guards and Railings.

31-5.6.1 Railings or guards not less than 42 in. (107 cm) above the aisle surface or footrest or not less than 36 in. (91 cm) vertically above the center of the seat or seat board surface, whichever is adjacent, shall be provided along those portions of the backs and ends of all grandstands where the seats are more than 4 ft (1.2 m) above the floor or ground.

Exception: This requirement shall not apply where an adjacent wall or fence affords equivalent safeguard. (101:12.4.8.6.1)

31-5.6.2 Where the front footrest of any grandstand is more than 2 ft (0.6 m) above the floor, railings or guards not less than 33 in. (84 cm) above such footrests shall be provided.

Exception: In grandstands, or where the front row of seats includes backrests, the rails shall be not less than 26 in. (66 cm) high. (101:12.4.8.6.2)

31-5.6.3 Cross aisles located within the seating area shall be provided with rails not less than 26 in. (66 cm) high along the front edge of the cross aisle.

Exception: Where the backs of the seats in front of the cross aisle project 24 in. (61 cm) or more above the surface of the cross aisle, the rail shall not be required. (101:12.4.8.6.3)

31-5.6.4 Vertical openings between guardrails and footboards or seat boards shall be provided with intermediate construction so that a 4-in. (10.2-cm) diameter sphere cannot pass through the opening. (101:12.4.8.6.4)

31-5.6.5 An opening between the seat board and footboard located more than 30 in. (76 cm) above grade shall be provided with intermediate construction so that a 4-in. (10.2-cm) diameter sphere cannot pass through the opening. (101:12.4.8.6.5)

31-6 Existing Grandstands.

31-6.1 General. Grandstands shall comply with the provisions of Chapter 13 of NFPA 101 as modified by Section 31-6 of this Code.

Exception: Existing grandstands shall be permitted to be continued to be used subject to the approval of the authority having jurisdiction. (101:13.4.8.1)

31-6.2 Seating.

31-6.2.1 Where grandstand seating without backs is used indoors, rows of seats shall be spaced not less than 22 in. (55.9 cm) back-to-back. (101:13.4.8.2.1)

31-6.2.2 The depth of footboards and seat boards in grandstands shall be not less than 9 in. (22.9 cm). Where the same level is not used for both seat foundations and footrests, footrests independent of seats shall be provided. (101:13.4.8.2.2)

31-6.2.3 Seats and footrests of grandstands shall be supported securely and fastened in such a manner that they cannot be displaced inadvertently. (101:13.4.8.2.3)

31-6.2.4 Individual seats or chairs shall be permitted only if secured firmly in rows in an approved manner, unless seats do not exceed 16 in number and are located on level floors and within railed-in enclosures, such as boxes. (101:13.4.8.2.4)

31-6.3 Special Requirements, Wood Grandstands.

31-6.3.1 An outdoor wood grandstand shall be erected within not less than two-thirds of its height and, in no case, within not less than 10 ft (3 m) of a building.

Exception No. 1: The distance requirement shall not apply for buildings of not less than 1-hour fire resistance-rated construction with openings protected against the fire exposure hazard created by the grandstand.

Exception No. 2: The distance requirement shall not apply where a wall of not less than 1-hour fire resistance-rated construction separates such a grandstand from the building. (101:13.4.8.3.1)

31-6.3.2 An outdoor wood grandstand unit shall not exceed 10,000 ft² (929 m²) in ground area or 200 ft (61 m) in length. Grandstand units of the maximum size shall be placed not less than 20 ft (6.1 m) apart or shall be separated by walls of 1-hour fire resistance rating. The number of such units erected in any one group shall not exceed three. Each group shall be separated from any other group by a wall of 2-hour fire resistance-rated construction extending 2 ft (0.6 m) above the seat platforms or by an open space of not less than 50 ft (15.2 m).

Exception: Where entirely constructed of labeled fire-retardant-treated wood that has passed the standard rain test, ASTM D 2898, Test Method for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing, or where constructed of members conforming to dimensions for heavy timber construction (Type IV (2HH)), the ground area or length shall be permitted to be doubled. (101:13.4.8.3.2)

31-6.3.3 The highest level of seat platforms above the ground or the surface at the front of the grandstand for any wood grandstand shall not exceed 20 ft (6.1 m). For portable grandstands within tents or membrane structures, the highest level shall not exceed 12 ft (3.7 m).

Exception: Where entirely constructed of labeled fire-retardant-treated wood that has passed the standard rain test, ASTM D 2898, Test Method for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing, or where constructed of members conforming to dimensions for heavy timber construction (Type IV (2HH)), the height shall be permitted to be doubled. (101:13.4.8.3.3)

31-6.4 Special Requirements, Portable Grandstands.

31-6.4.1 Portable grandstands shall conform to the requirements of Section 31-6 for grandstands and the requirements of 31-6.4.2 and 31-6.4.3. (101:13.4.8.4.1)

31-6.4.2 Portable grandstands shall be self-contained and shall have within them all necessary parts to withstand and restrain all forces that might be developed during human occupancy. They shall be designed and manufactured so that if any structural members essential to the strength and stability of the structure have been omitted during erection, the presence of unused connection fittings shall make the omissions self-evident. The construction shall be skillfully accomplished to produce the strength required by the design. (101:13.4.8.4.2)

31-6.4.3 Portable grandstands shall be provided with base plates, sills, floor runners, or sleepers of such area that the permitted bearing capacity of the supporting material is not exceeded. Where portable grandstands rest directly on a base of such character that it is incapable of supporting the load without appreciable settlement, mud sills of suitable material, having sufficient area to prevent undue or dangerous settlement, shall be installed under base plates, runners, or sleepers. All bearing surfaces shall be in contact with each other. (101:13.4.8.4.3)

31-6.5 Spaces Underneath Grandstands. Spaces underneath a grandstand shall be kept free of flammable or combustible materials, unless protected by an approved, supervised automatic sprinkler system in accordance with Section 9.7 of NFPA 101.

Exception No. 1: This requirement shall not apply to accessory uses of 300 ft² (28 m²) or less in area where of noncombustible or fire-resistive construction, such as ticket booths, toilet facilities, or concession booths, in otherwise nonsprinklered facilities.

Exception No. 2: This requirement shall not apply to rooms enclosed in not less than 1-hour fire resistance-rated construction that are less than 1000 ft² (93 m²) in area in otherwise nonsprinklered facilities. (101:13.4.8.5)

31-6.6 Guards and Railings.

31-6.6.1 Railings or guards not less than 42 in. (107 cm) above the aisle surface or footrest or not less than 36 in. (91 cm) vertically above the center of the seat or seat board surface, whichever is adjacent, shall be provided along those portions of the backs and ends of all grandstands where the seats are in excess of 4 ft (1.2 m) above the floor or ground.

Exception: This requirement shall not apply where an adjacent wall or fence affords equivalent safeguard. (101:13.4.8.6.1)

31-6.6.2 Where the front footrest of any grandstand is more than 2 ft (0.6 m) above the floor, railings or guards not less than 33 in. (84 cm) above such footrests shall be provided.

Exception: In grandstands, or where the front row of seats includes backrests, the rails shall be not less than 26 in. (66 cm) high. (101:13.4.8.6.2)

31-6.6.3 Cross aisles located within the seating area shall be provided with rails not less than 26 in. (66 cm) high along the front edge of the cross aisle.

Exception: Where the backs of the seats in front of the cross aisle project 24 in. (61 cm) or more above the surface of the cross aisle, the rail shall not be required. (101:13.4.8.6.3)

31-6.6.4 Vertical openings between guardrails and footboards or seat boards shall be provided with intermediate construction so that a 4-in. (10.2-cm) diameter sphere cannot pass through the opening. (101:13.4.8.6.4)

31-6.6.5 An opening between the seat board and footboard located more than 30 in. (76 cm) above grade shall be provided with intermediate construction so that a 4-in. (10.2-cm) diameter sphere cannot pass through the opening. (101:13.4.8.6.5)

31-7 New Folding and Telescopic Seating.

31-7.1 General. Folding and telescopic seating shall comply with the provisions of Chapter 12 of NFPA 101 as modified by Section 31-7 of this Code. (101:12.4.9.1)

31-7.2 Seating.

31-7.2.1 The horizontal distance of seats, measured back-to-back, shall be not less than 22 in. (55.9 cm) for seats without backs. There shall be a space of not less than 12 in. (30.5 cm) between the back of each seat and the front of each seat immediately behind it. If seats are of the chair type, the 12-in. (30.5-cm) dimension shall be measured to the front edge of the rear seat in its normal unoccupied position. All measurements shall be taken between plumb lines. (101:12.4.9.2.1)

31-7.2.2 The depth of footboards (footrests) and seat boards in folding and telescopic seating shall be not less than 9 in. (22.9 cm). Where the same level is not used for both seat foundations and footrests, footrests independent of seats shall be provided. (101:12.4.9.2.2)

31-7.2.3 Individual chair-type seats shall be permitted in folding and telescopic seating only if firmly secured in groups of not less than three. (101:12.4.9.2.3)

31-7.3 Guards and Railings.

31-7.3.1 Railings or guards not less than 42 in. (107 cm) above the aisle surface or footrest or not less than 36 in. (91 cm) vertically above the center of the seat or seat board surface, whichever is adjacent, shall be provided along those portions of the backs and ends of all folding and telescopic seating where the seats are more than 4 ft (1.2 m) above the floor or ground.

Exception: This requirement shall not apply where an adjacent wall or fence affords equivalent safeguard. (101:12.4.9.3.1)

31-7.3.2 Where the front footrest of folding or telescopic seating is more than 2 ft (0.6 m) above the floor, railings or guards not less than 33 in. (84 cm) above such footrests shall be provided.

Exception: Where the front row of seats includes backrests, the rails shall be not less than 26 in. (66 cm) high. (101:12.4.9.3.2)

31-7.3.3 Cross aisles located within the seating area shall be provided with rails not less than 26 in. (66 cm) high along the front edge of the cross aisle.

Exception: Where the backs of the seats in front of the cross aisle project 24 in. (61 cm) or more above the surface of the cross aisle, the rail shall not be required. (101:12.4.9.3.3)

31-7.3.4 Vertical openings between guardrails and footboards or seat boards shall be provided with intermediate construction so that a 4-in. (10.2-cm) diameter sphere cannot pass through the opening. (101:12.4.9.3.4)

31-7.3.5 An opening between the seat board and footboard located more than 30 in. (76 cm) above grade shall be provided with intermediate construction so that a 4-in. (10.2-cm) diameter sphere cannot pass through the opening. (**101:12.4.9.3.5**)

31-8 Existing Folding and Telescopic Seating.

31-8.1 General. Folding and telescopic seating shall comply with the provisions of Chapter 13 of NFPA 101 as modified by Section 31-8 of this Code.

Exception: Existing folding and telescopic seating shall be permitted to be continued to be used subject to the approval of the authority having jurisdiction. (101:13.4.9.1)

31-8.2 Seating.

31-8.2.1 The horizontal distance of seats, measured back-to-back, shall be not less than 22 in. (55.9 cm) for seats without backs. There shall be a space of not less than 12 in. (30.5 cm) between the back of each seat and the front of each seat immediately behind it. If seats are of the chair type, the 12-in. (30.5-cm) dimension shall be measured to the front edge of the rear seat in its normal unoccupied position. All measurements shall be taken between plumb lines. (**101:13.4.9.2.1**)

31-8.2.2 The depth of footboards (footrests) and seat boards in folding and telescopic seating shall be not less than 9 in. (22.9 cm). Where the same level is not used for both seat foundations and footrests, footrests independent of seats shall be provided. (**101:13.4.9.2.2**)

31-8.2.3 Individual chair-type seats shall be permitted in folding and telescopic seating only if firmly secured in groups of not less than three. (**101:13.4.9.2.3**)

31-8.3 Guards and Railings.

31-8.3.1 Railings or guards not less than 42 in. (107 cm) above the aisle surface or footrest or not less than 36 in. (91 cm) vertically above the center of the seat or seat board surface, whichever is adjacent, shall be provided along those portions of the backs and ends of all folding and telescopic seating where the seats are more than 4 ft (1.2 m) above the floor or ground.

Exception: This requirement shall not apply where an adjacent wall or fence affords equivalent safeguard. (101:13.4.9.3.1)

31-8.3.2 Where the front footrest of folding or telescopic seating is more than 2 ft (0.6 m) above the floor, railings or guards not less than 33 in. (84 cm) above such footrests shall be provided.

Exception: Where the front row of seats includes backrests, the rails shall be not less than 26 in. (66 cm) high. (101:13.4.9.3.2)

31-8.3.3 Cross aisles located within the seating area shall be provided with rails not less than 26 in. (66 cm) high along the front edge of the cross aisle.

Exception: Where the backs of the seats in front of the cross aisle project 24 in. (61 cm) or more above the surface of the cross aisle, the rail shall not be required. (101:13.4.9.3.3)

31-8.3.4 Vertical openings between guardrails and footboards or seat boards shall be provided with intermediate construction so that a 4-in. (10.2-cm) diameter sphere cannot pass through the opening. (**101:13.4.9.3.4**)

31-8.3.5 An opening between the seat board and footboard located more than 30 in. (76 cm) above grade shall be provided with intermediate construction so that a 4-in. (10.2-cm) diameter sphere cannot pass through the opening. (**101:13.4.9.3.5**)

31-9 Maintenance of Outdoor Grandstands. The owner shall provide for not less than annual inspection and required maintenance of each outdoor grandstand to ensure safe conditions. At least biennially, the inspection shall be performed by a professional engineer, registered architect, or individual certified by the manufacturer. Where required by the authority having jurisdiction, the owner shall provide certification that such inspection has been performed. (**101:12.7.9; 101:13.7.9**)

31-10 Maintenance and Operation of Folding and Telescopic Seating.

31-10.1 Instructions in both maintenance and operation shall be transmitted to the owner by the manufacturer of the seating or his or her representative. (**101:12.7.10.1; 101:13.7.10.1**)

31-10.2 Maintenance and operation of folding and telescopic seating shall be the responsibility of the owner or his or her duly authorized representative and shall include the following:

- (1) During operation of the folding and telescopic seats, the opening and closing shall be supervised by responsible personnel who shall ensure that the operation is in accordance with the manufacturer's instructions.
- (2) Only attachments specifically approved by the manufacturer for the specific installation shall be attached to the seating.
- (3) An annual inspection and required maintenance of each grandstand shall be performed to ensure safe conditions. At least biennially, the inspection shall be performed by a professional engineer, registered architect, or individual certified by the manufacturer. (**101:12.7.10.2; 101:13.7.10.2**)

Chapter 32 Referenced Publications

32-1 The following documents or portions thereof are referenced within this code as mandatory requirements and shall be considered part of the requirements of this code. The edition indicated for each referenced mandatory document is the current edition as of the date of the NFPA issuance of this code. Some of these mandatory documents might also be referenced in this code for specific informational purposes and, therefore, are also listed in Appendix D.

32-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers*, 1998 edition.
 NFPA 11, *Standard for Low-Expansion Foam*, 1998 edition.
 NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems*, 1999 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 2000 edition.

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*, 1997 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1999 edition.

NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, 1999 edition.

NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, 1999 edition.

NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*, 2000 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, 1996 edition.

NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*, 1999 edition.

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 1998 edition.

NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*, 1998 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 1999 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 1995 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 1998 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 1996 edition.

NFPA 30A, *Automotive and Marine Service Station Code*, 1996 edition.

NFPA 30B, *Code for the Manufacture and Storage of Aerosol Products*, 1998 edition.

NFPA 31, *Standard for the Installation of Oil-Burning Equipment*, 1997 edition.

NFPA 32, *Standard for Drycleaning Plants*, 1996 edition.

NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*, 1995 edition.

NFPA 34, *Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids*, 1995 edition.

NFPA 36, *Standard for Solvent Extraction Plants*, 1997 edition.

NFPA 40, *Standard for the Storage and Handling of Cellulose Nitrate Motion Picture Film*, 1997 edition.

NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*, 1996 edition.

NFPA 50B, *Standard for Liquefied Hydrogen Systems at Consumer Sites*, 1999 edition.

NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes*, 1997 edition.

NFPA 51A, *Standard for Acetylene Cylinder Charging Plants*, 1996 edition.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, 1999 edition.

NFPA 52, *Compressed Natural Gas (CNG) Vehicular Fuel Systems Code*, 1998 edition.

NFPA 54, *National Fuel Gas Code*, 1999 edition.

NFPA 57, *Liquefied Natural Gas (LNG) Vehicular Fuel Systems Code*, 1999 edition.

NFPA 58, *Liquefied Petroleum Gas Code*, 1998 edition.

NFPA 59, *Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants*, 1998 edition.

NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*, 1996 edition.

NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Products Facilities*, 1999 edition.

NFPA 69, *Standard on Explosion Prevention Systems*, 1997 edition.

NFPA 70, *National Electrical Code®*, 1999 edition.

NFPA 72, *National Fire Alarm Code®*, 1999 edition.

NFPA 80, *Standard for Fire Doors and Fire Windows*, 1999 edition.

NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment*, 1999 edition.

NFPA 86, *Standard for Ovens and Furnaces*, 1999 edition.

NFPA 86C, *Standard for Industrial Furnaces Using a Special Processing Atmosphere*, 1999 edition.

NFPA 86D, *Standard for Industrial Furnaces Using Vacuum as an Atmosphere*, 1999 edition.

NFPA 88A, *Standard for Parking Structures*, 1998 edition.

NFPA 88B, *Standard for Repair Garages*, 1997 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, 1999 edition.

NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*, 1999 edition.

NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids*, 1999 edition.

NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, 1998 edition.

NFPA 99, *Standard for Health Care Facilities*, 1999 edition.

NFPA 101®, *Life Safety Code®*, 2000 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems*, 1999 edition.

NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*, 1996 edition.

NFPA 120, *Standard for Coal Preparation Plants*, 1999 edition.

NFPA 140, *Standard on Motion Picture and Television Production Studio Soundstages and Approved Production Facilities*, 1999 edition.

NFPA 160, *Standard for Flame Effects Before an Audience*, 1998 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, 2000 edition.

NFPA 220, *Standard on Types of Building Construction*, 1999 edition.

NFPA 221, *Standard for Fire Walls and Fire Barrier Walls*, 1997 edition.

NFPA 230, *Standard for the Fire Protection of Storage*, 1999 edition.

NFPA 231D, *Standard for Storage of Rubber Tires*, 1998 edition.

NFPA 232, *Standard for the Protection of Records*, 1995 edition.

NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*, 1996 edition.

NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*, 1999 edition.

NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*, 1999 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, 2000 edition.

NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*, 1998 edition.

NFPA 257, *Standard on Fire Test for Window and Glass Block Assemblies*, 2000 edition.

NFPA 260, *Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture*, 1998 edition.

NFPA 303, *Fire Protection Standard for Marinas and Boatyards*, 1995 edition.

NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*, 1995 edition.

NFPA 312, *Standard for Fire Protection of Vessels During Construction, Repair, and Lay-Up*, 1995 edition.

NFPA 318, *Standard for the Protection of Cleanrooms*, 1998 edition.

NFPA 385, *Standard for Tank Vehicles for Flammable and Combustible Liquids*, 2000 edition.

NFPA 407, *Standard for Aircraft Fuel Servicing*, 1996 edition.

NFPA 409, *Standard on Aircraft Hangars*, 1995 edition.

NFPA 410, *Standard on Aircraft Maintenance*, 1999 edition.

NFPA 415, *Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways*, 1997 edition.

NFPA 418, *Standard for Heliports*, 1995 edition.

NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers*, 2000 edition.

NFPA 432, *Code for the Storage of Organic Peroxide Formulations*, 1997 edition.

NFPA 434, *Code for the Storage of Pesticides*, 1998 edition.

NFPA 480, *Standard for the Storage, Handling, and Processing of Magnesium Solids and Powders*, 1998 edition.

NFPA 481, *Standard for the Production, Processing, Handling, and Storage of Titanium*, 1995 edition.

NFPA 482, *Standard for the Production, Processing, Handling, and Storage of Zirconium*, 1996 edition.

NFPA 485, *Standard for the Storage, Handling, Processing, and Use of Lithium Metal*, 1999 edition.

NFPA 490, *Code for the Storage of Ammonium Nitrate*, 1998 edition.

NFPA 495, *Explosive Materials Code*, 1996 edition.

NFPA 498, *Standard for Safe Havens and Interchange Lots for Vehicles Transporting Explosives*, 1996 edition.

NFPA 501, *Standard on Manufactured Housing*, 1999 edition.

NFPA 501A, *Standard for Fire Safety Criteria for Manufactured Home Installations, Sites, and Communities*, 1999 edition.

NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation*, 1999 edition.

NFPA 650, *Standard for Pneumatic Conveying Systems for Handling Combustible Particulate Solids*, 1998 edition.

NFPA 651, *Standard for the Machining and Finishing of Aluminum and the Production and Handling of Aluminum Powders*, 1998 edition.

NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids*, 1997 edition.

NFPA 655, *Standard for Prevention of Sulfur Fires and Explosions*, 1993 edition.

NFPA 664, *Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities*, 1998 edition.

NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*, 1999 edition.

NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*, 1996 edition.

NFPA 909, *Standard for the Protection of Cultural Resources, Including Museums, Libraries, Places of Worship, and Historic Properties*, 1997 edition.

NFPA 1122, *Code for Model Rocketry*, 1997 edition.

NFPA 1123, *Code for Fireworks Display*, 1995 edition.

NFPA 1124, *Code for the Manufacture, Transportation, and Storage of Fireworks and Pyrotechnic Articles*, 1998 edition.

NFPA 1125, *Code for the Manufacture of Model Rocket and High Power Rocket Motors*, 1995 edition.

NFPA 1126, *Standard for the Use of Pyrotechnics before a Proximate Audience*, 1996 edition.

NFPA 1127, *Code for High Power Rocketry*, 1998 edition.

NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*, 1999 edition.

NFPA 1194, *Standard for Recreational Vehicle Parks and Campgrounds*, 1999 edition.

NFPA 1561, *Standard on Emergency Service Incident Management System*, 2000 edition.

NFPA 1963, *Standard for Fire Hose Connections*, 1998 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, 2000 edition.

NFPA 8503, *Standard for Pulverized Fuel Systems*, 1997 edition.

32-1.2 Other Publications.

32-1.2.1 API Publication. American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005.

API-ASME *Code for Unfired Pressure Vessels for Petroleum Liquids and Gases*, Pre-July 1, 1961.

32-1.2.2 ASME Publications. American Society of Mechanical Engineers, 3 Park Avenue, New York, NY 10017.

ASME/ANSI A17.1, *Safety Code for Elevators and Escalators*, 1996.

ASME/ANSI A17.3, *Safety Code for Existing Elevators and Escalators*, 1996.

ASME *Boiler and Pressure Vessel Code*, Section VIII, "Rules for the Construction of Unfired Pressure Vessels," 1998.

32-1.2.3 ASTM Publications. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 2898, *Test Method for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing*, 1994.

ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 1998.

32-1.2.4 CGA Publication. Compressed Gas Association, Inc., 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4100.

CGA C-4, *Method of Marking Portable Compressed Gas Containers to Identify the Material Contained*, 1990.

32-1.2.5 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL 8, *Standard for Foam Fire Extinguishers*, 1995.

UL 147A, *Standard for Nonrefillable (Disposable) Type Fuel Gas Cylinder Assemblies*, 1996.

UL 147B, *Standard for Nonrefillable (Disposal) Type Metal Container Assemblies for Butane*, 1996.

UL 154, *Standard for Carbon Dioxide Fire Extinguishers*, 1995.

UL 197, *Standard for Commercial Electric Cooking Appliances*, 1993.

UL 299, *Standard for Dry Chemical Fire Extinguishers*, 1995.

UL 300, *Standard for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas*, 1996.

UL 567, *Standard Pipe Connectors for Flammable and Combustible Liquids and LP-Gas*, 1996.

UL 626, *Standard for 2¹/₂ Gallon Stored Pressure Water Type Fire Extinguishers*, 1995.

UL 711, *Standard for Rating and Fire Testing of Fire Extinguishers*, 1995.

UL 842, *Standard for Valves for Flammable Fluids*, 6th Edition, 1997.

UL 900, *Standard for Test Performance of Air Filter Units*, 1994.

UL 924, *Standard for Emergency Lighting and Power Equipment*, 1995.

UL 1093, *Standard for Halogenated Agent Fire Extinguishers*, 1995.

UL 1975, *Standard for Fire Tests for Foamed Plastics Used for Decorative Purposes*, 1996.

UL 2085, *Standard for Insulated Aboveground Tanks for Flammable and Combustible Liquids*, 1997.

32-1.2.6 ULC Publications. Underwriters Laboratories of Canada, 7 Crouse Road, Scarborough, Ontario, M1R 3A9.

ULC-S503, *Standard for Carbon Dioxide Hand and Wheeled Fire Extinguishers*, 1990.

ULC-S504, *Standard for Dry Chemical and Dry Powder Hand and Wheeled Fire Extinguishers*, 1986.

ULC-S507, *Standard for 9 Litre Stored Pressure Water Type Fire Extinguishers*, 1983.

ULC-S508, *Standard for Rating and Fire Testing of Fire Extinguishers*, 1990.

ULC-S512, *Standard for Halogenated Agent Fire Extinguishers*, 1987.

32-1.2.7 U.S. Government Publications. U.S. Government Printing Office, Washington, DC, 20402.

FAA A/C 150/5390-2, *Heliport Design Advisory Circular*, January 4, 1988.

ICC Rules for Construction of Unfired Pressure Vessels, April 1, 1967.

Title 16, *Code of Federal Regulations*, Parts 1500 and 1507, U.S. Consumer Product Safety Commission.

Title 16, *Code of Federal Regulations*, Part 1632, *Standard for the Flammability of Mattresses and Mattress Pads*, January 1, 1990.

Title 40, *Code of Federal Regulations*, Parts 152.175 and 156.10(i) (A).

Title 49, *Code of Federal Regulations*, Transportation.

32-1.2.8 Webster's Third New International Dictionary of the English Language, Unabridged.

Appendix A Explanatory Material

Appendix A is not a part of the requirements of this NFPA document but is included for informational purposes only. This appendix contains explanatory material, numbered to correspond with the applicable text paragraphs.

A-1-7 The *Introduction to Performance-Based Fire Safety* provides information that can assist in the preparation and analysis of performance-based design submittals.

A-1-7.1 Comparison of the equivalent method or design with the prescriptive code compliant method or design, using the same engineering methodologies, should provide one option for evaluation and acceptance by the authority having jurisdiction.

A-1-9.3 The authority having jurisdiction should take into account the maintenance of required means of egress and fire protection systems during the construction, repair, alteration, or addition to the building. If necessary, alternative protection features can be required to ensure that no imminent hazards exist as the result of modifications.

A-1-9.4 Examples of changes from one occupancy subclassification to another subclassification of the same occupancy could include a change from a Class B to a Class A mercantile occupancy. Hospitals and nursing homes are both health care occupancies and are defined separately, but they are not established as separate suboccupancies; thus, a change from one to the other does not constitute a change of occupancy subclassification.

For example, a building was used as a hospital but has been closed for four years. It is again to be used as a hospital. As long as the building was not used as another occupancy during the time it was closed, it would be considered an existing hospital.

Hotels and apartments, although both residential occupancies, are treated separately, and a change from one to the other constitutes a change of occupancy. (**101:A.4.6.11**)

A-1-10.2 Any “nonrequired” system that, if not maintained properly, could create a false sense of security can be considered as creating an unsafe condition and therefore should be removed or properly maintained.

A-1-10.3 Examples of such features include automatic sprinklers, fire alarm systems, standpipes, and portable fire extinguishers. The presence of a life safety feature, such as sprinklers or fire alarm devices, creates a reasonable expectation by the public that these safety features are functional. When systems are inoperable or taken out of service but the devices remain, they present a false sense of safety. Also, before taking any life safety features out of service, extreme care needs to be exercised to ensure that the feature is not required, was not originally provided as an alternative or equivalency, or is no longer required due to other new requirements in this current Code or NFPA 101, *Life Safety Code*. It is not intended that the entire system or protection feature be removed. Instead, components such as sprinklers, ini-

tiating devices, notification appliances, standpipe hose, and exit systems should be removed to reduce the likelihood of relying on inoperable systems or features. (**101:A.4.6.12.2**)

A-1-14.1.1 This requirement should not be construed to forbid the owner, manager, or other person in control of the aforementioned building or premises from using all diligence necessary to extinguish such fire prior to the arrival of the fire department.

A-1-16.14 Figure A-1-16.14 shows a sample permit application. (See pg. 1-142.)

A-1-18.6 A third-party reviewer is a person or group of persons chosen by the authority having jurisdiction to review a proposed design, operation, process, or new technology when the complexity of the design exceeds the capabilities of the authority having jurisdiction to determine whether the proposed design, operation, process, or new technology has met the code requirements.

A-2-1.5 Airport Terminal Building. The term “Terminal” is sometimes applied to airport facilities other than those serving passengers, such as cargo and freight facilities and fueling-handling facilities. These facilities are covered by other NFPA standards such as NFPA 513, *Standard for Motor Freight Terminals*, and NFPA 30, *Flammable and Combustible Liquids Code*. (**415:A-1-4**)

A-2-1.9 Apartment Building. NFPA 101, *Life Safety Code*, specifies, that wherever there are three or more living units in a building, the building is considered an apartment building and is required to comply with either Chapter 30 or 31 of NFPA 101, as appropriate. Townhouse units are considered to be apartment buildings if there are three or more units in the building. The type of wall required between units in order to consider them to be separate buildings is normally established by the authority having jurisdiction. If the units are separated by a wall of sufficient fire resistance and structural integrity to be considered as separate buildings, then the provisions of Chapter 24 of NFPA 101 apply to each townhouse. Condominium status is a form of ownership, not occupancy; for example, there are condominium warehouses, condominium apartments, and condominium offices. (**101:A.3.3.25.1**)

A-2-1.10 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

FIGURE A-1-16.14 Example of a permit application.

| (Front) | (Rear) |
|--|--|
| PERMIT FOR CUTTING AND WELDING WITH PORTABLE GAS OR ARC EQUIPMENT | ATTENTION Before approving any cutting and welding permit, the fire safety supervisor or his appointee shall inspect the work area and confirm that precautions have been taken to prevent fire in accordance with NFPA 51B. |
| Date _____ Building _____ Dept. _____ Floor _____ Work to be done _____ _____ Special precautions _____ _____ Is fire watch required? _____ The location where this work is to be done has been examined, necessary precautions taken, and permission is granted for this work. (See other side.) Permit expires _____ Signed _____ <div style="text-align: center; font-size: small;">(Individual responsible for authorizing cutting and welding)</div> Time started _____ Completed _____ <hr/> <div style="text-align: center;"> FINAL CHECK-UP Work area and all adjacent areas to which sparks and heat might have spread (including floors above and below and on opposite sides of walls) were inspected 30 minutes after the work was completed and were found firesafe. </div> Signed _____ <div style="text-align: center; font-size: small;">(Supervisor or Fire Watcher)</div> | <div style="text-align: center;"> PRECAUTIONS <input type="checkbox"/> Sprinklers in service <input type="checkbox"/> Cutting and welding equipment in good repair </div> <div style="text-align: center;"> WITHIN 35 FT (10.7 M) OF WORK <input type="checkbox"/> Floors swept clean of combustibles <input type="checkbox"/> Combustible floors wet down, covered with damp sand, metal, or other shields <input type="checkbox"/> No combustible material or flammable liquids <input type="checkbox"/> Combustibles and flammable liquids protected with covers, guards, or metal shields <input type="checkbox"/> All wall and floor openings covered <input type="checkbox"/> Covers suspended beneath work to collect sparks </div> <div style="text-align: center;"> WORK ON WALLS OR CEILINGS <input type="checkbox"/> Construction noncombustible and without combustible covering <input type="checkbox"/> Combustibles moved away from opposite side of wall </div> <div style="text-align: center;"> WORK ON ENCLOSED EQUIPMENT (Tanks, containers, ducts, dust collectors, etc.) <input type="checkbox"/> Equipment cleaned of all combustibles <input type="checkbox"/> Containers purged of flammable vapors </div> <div style="text-align: center;"> FIRE WATCH <input type="checkbox"/> To be provided during and 30 minutes after operation <input type="checkbox"/> Supplied with extinguisher and small hose <input type="checkbox"/> Trained in use of equipment and in sounding fire alarm </div> <div style="text-align: center;"> FINAL CHECK-UP <input type="checkbox"/> To be made 30 minutes after completion of any operation unless fire watch is provided </div> Signed _____ <div style="text-align: center; font-size: small;">(Supervisor)</div> |

A-2-1.13 Assembly Occupancy. Assembly occupancies might include the following:

- (1) Armories
- (2) Assembly halls
- (3) Auditoriums
- (4) Bowling lanes
- (5) Club rooms
- (6) College and university classrooms, 50 persons and over
- (7) Conference rooms
- (8) Courtrooms
- (9) Dance halls
- (10) Drinking establishments
- (11) Exhibition halls
- (12) Gymnasiums
- (13) Libraries
- (14) Mortuary chapels
- (15) Motion picture theaters
- (16) Museums
- (17) Passenger stations and terminals of air, surface, underground, and marine public transportation facilities
- (18) Places of religious worship
- (19) Pool rooms

- (20) Recreation piers
- (21) Restaurants
- (22) Skating rinks
- (23) Special amusement buildings regardless of occupant load
- (24) Theaters

Assembly occupancies are characterized by the presence or potential presence of crowds with attendant panic hazard in case of fire or other emergency. They are generally open or occasionally open to the public, and the occupants, who are present voluntarily, are not ordinarily subject to discipline or control. Such buildings are ordinarily occupied by able-bodied persons and are not used for sleeping purposes. Special conference rooms, snack areas, and other areas incidental to, and under the control of, the management of other occupancies, such as offices, fall under the 50-person limitation.

Restaurants and drinking establishments with an occupant load of fewer than 50 persons should be classified as mercantile occupancies.

For special amusement buildings, see 12.4.7 and 13.4.7 of NFPA 101. (**101:A.3.3.134.2**)

A-2-1.14 Authority Having Jurisdiction. The phrase “authority having jurisdiction” is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A-2-1.18 Building. The term *building* is to be understood as if followed by the words *or portions thereof*. (See also *Structure*, A-2-1.159). (101:A.3.3.25)

A-2-1.18.1 Building, Existing. With respect to judging whether a building should be considered existing, the deciding factor is not when the building was designed or when construction started but, rather, the date plans were approved for construction by the appropriate authority having jurisdiction. (101:A.3.3.25.4)

A-2-1.20 Business Occupancy. Business occupancies include the following:

- (1) Air traffic control towers (ATCTs)
- (2) City halls
- (3) College and university instructional buildings, classrooms under 50 persons, and instructional laboratories
- (4) Courthouses
- (5) Dentists' offices
- (6) Doctors' offices
- (7) General offices
- (8) Outpatient clinics, ambulatory
- (9) Town halls

Doctors' and dentists' offices are included, unless of such character as to be classified as ambulatory health care occupancies. (See 2-1.7.)

Birth centers occupied by fewer than four patients, not including infants, at any one time; not providing sleeping facilities for four or more occupants; and not providing treatment procedures that render four or more patients, not including infants, incapable of self-preservation at any one time should be classified as business occupancies. For birth centers occupied by patients not meeting these parameters, see Chapter 18 or Chapter 19 of NFPA 101, as appropriate.

Service facilities common to city office buildings such as newsstands, lunch counters serving fewer than 50 persons, barber shops, and beauty parlors are included in the business occupancy group.

City halls, town halls, and court houses are included in this occupancy group insofar as their principal function is the transaction of public business and the keeping of books and records. Insofar as they are used for assembly purposes, they are classified as assembly occupancies. (101:A.3.3.134.3)

A-2-1.32 Code. The decision to designate a standard as a “code” is based on such factors as the size and scope of the document, its intended use and form of adoption, and whether it contains substantial enforcement and administrative provisions.

A-2-1.34 Combustible Dust. Any time a combustible dust is processed or handled, a potential for deflagration exists. The degree of deflagration hazard will vary depending on the type of combustible dust and processing methods used.

A dust explosion has the following four requirements:

- (1) A combustible dust
- (2) A dust dispersion in air or oxygen at or exceeding the minimum combustible concentration
- (3) An ignition source such as an electrostatic discharge, an electric current arc, a glowing ember, a hot surface, welding slag, frictional heat, or a flame
- (4) Confinement

Evaluation of the hazard of a combustible dust should be determined by the means of actual test data. The following list represents factors that can be considered when determining the deflagration hazard of a dust:

- (1) Minimum dust concentration to ignite
- (2) Minimum energy required for ignition (joules)
- (3) Particle size distribution
- (4) Moisture content as received and dried
- (5) Deflagration index (K_{St})
- (6) Layer ignition temperature
- (7) Maximum explosion pressure, at optimum concentration
- (8) Electrical volume resistivity measurement
- (9) Dust cloud ignition temperature
- (10) Maximum permissible oxygen concentration (MOC) to prevent deflagration

(650:A-1-5)

A-2-1.36 Combustible Particulate Solid. A definition of this breadth is necessary because it is crucial to address the fact that there is attrition of the material as it is conveyed. Pieces and particles rub against each other and collide with the walls of the duct as they travel through the system. This breaks the material down and produces a mixture of pieces and much finer particles, called “dusts.” Consequently, we should expect every conveying system to produce dusts as an inherent by-product of the conveying process, regardless of the starting size of the material. (650:A-1-5)

A-2-1.40 Common Path of Travel. Common path of travel is measured in the same manner as travel distance but terminates at that point where two separate and distinct routes become available. Paths that merge are common paths of travel. (101:A.3.3.32)

A-2-1.42 Consumer Fireworks. Consumer fireworks contain limited quantities of pyrotechnic composition per unit and do not pose a mass explosion hazard where stored. Therefore, they are not required to be stored in a magazine.

Consumer fireworks are normally classed as Explosives, 1.4G and described as Fireworks, UN 0336 by the U.S. Department of Transportation (U.S. DOT). (1124:A-1-4)

A-2-1.45 Day-Care Home. A day-care home is generally located within a dwelling unit. (101:A.3.3.39)

A-2-1.46 Day-Care Occupancy. Day-care occupancies include the following:

- (1) Adult day-care occupancies, except where part of a health care occupancy
- (2) Child day-care occupancies
- (3) Day-care homes
- (4) Kindergarten classes that are incidental to a child day-care occupancy
- (5) Nursery schools

In areas where public schools offer only half-day kindergarten programs, many child day-care occupancies offer state-approved kindergarten classes for children who need full-day care. As these classes are normally incidental to the day-care occupancy, the requirements of the day-care occupancy should be followed. (101:A.3.3.134.4)

A-2-1.51 Detention and Correctional Occupancy. Detention and correctional occupancies include the following:

- (1) Adult and juvenile substance abuse centers
- (2) Adult and juvenile work camps
- (3) Adult community residential centers
- (4) Adult correctional institutions
- (5) Adult local detention facilities
- (6) Juvenile community residential centers
- (7) Juvenile detention facilities
- (8) Juvenile training schools (101:A.3.3.134.5)

A-2-1.53 Dormitory. Rooms within dormitories intended for the use of individuals for combined living and sleeping purposes are guest rooms or guest suites. Examples of dormitories are college dormitories, fraternity and sorority houses, and military barracks. (101:A.3.3.46)

A-2-1.55 Educational Occupancy. Educational occupancies include the following:

- (1) Academies
- (2) Kindergartens
- (3) Schools

An educational occupancy is distinguished from an assembly occupancy in that the same occupants are regularly present. (101:A.3.3.134.6)

A-2-1.57 Existing. See *Building, Existing*, A-2-1.18.1. (101:A.3.3.59)

A-2-1.59 Exit. Exits include exterior exit doors, exit passageways, horizontal exits, exit stairs, and exit ramps. In the case of a stairway, the exit includes the stair enclosure, the door to the stair enclosure, stairs and landings inside the enclosure, the door from the stair enclosure to the outside or to the level of exit discharge, and any exit passageway and its associated doors if such are provided so as to discharge the stair directly to the outside. In the case of a door leading directly from the street floor to the street or open air, the exit comprises only the door.

Doors of small individual rooms, as in hotels, while constituting exit access from the room, are not referred to as exits except where they lead directly to the outside of the building from the street floor. (101:A.3.3.61)

A-2-1.63 Fire Compartment. Additional fire compartment information is contained in 8.2.2 of NFPA 101.

In the provisions for fire compartments utilizing the outside walls of a building, it is not intended that the outside wall be specifically fire resistance-rated unless required by other standards. Likewise, it is not intended for outside windows or doors to be protected, unless specifically required for exposure protection by another section of this Code, NFPA 101, or by other standards. (101:A.3.3.71)

A-2-1.66 Fire Hydrant. Figures A-2-1.66(a) and A-2-1.66(b) show two hydrant arrangements. (25:1-5)

A-2-1.73 Floor Area, Gross. Where the term *floor area* is used, it should be understood to be gross floor area unless otherwise specified. (101:A.3.3.81)

FIGURE A-2-1.66(a) Typical fire hydrant connection.
[25:Figure 1-5(a) (1)]

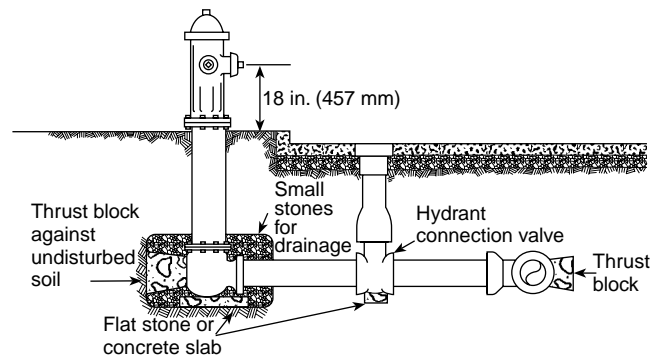
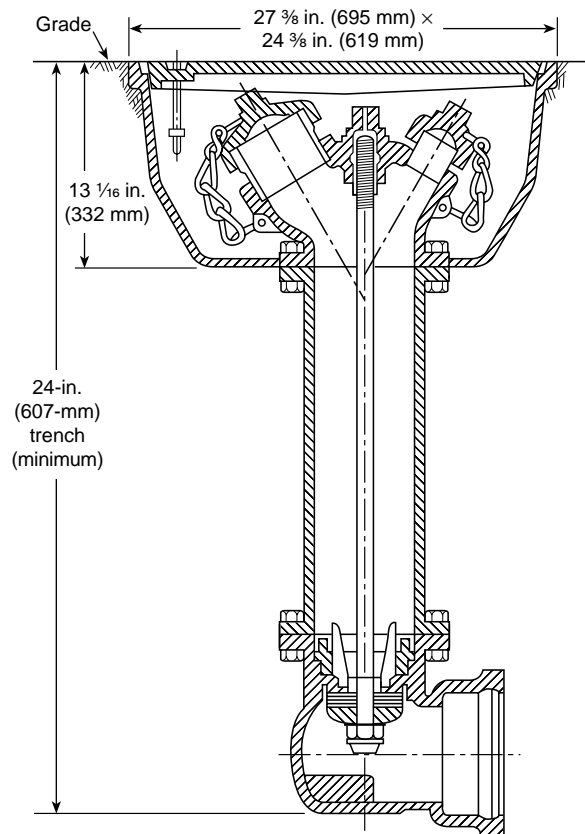


FIGURE A-2-1.66(b) Flush-type hydrant.
[25:Figure 1-5(a) (2)]



A-2-1.77.1 High Hazard Contents. High hazard contents include occupancies where flammable liquids are handled or used or are stored under conditions involving possible release of flammable vapors; where grain dust, wood flour or plastic dust, aluminum or magnesium dust, or other explosive dusts are produced; where hazardous chemicals or explosives are manufactured, stored, or handled; where cotton or other combustible fibers are processed or handled under conditions producing flammable flyings; and other situations of similar hazard.

Chapter 40 and Chapter 42 of NFPA 101 include detailed provisions on high hazard contents. (101:A.6.2.2.4)

A-2-1.77.2 Low Hazard. Chapter 42 of NFPA 101 recognizes storage of noncombustible materials as low hazard. In other occupancies it is assumed that, even where the actual contents hazard is normally low, there is sufficient likelihood that some combustible materials or hazardous operations will be introduced in connection with building repair or maintenance, or some psychological factor might create conditions conducive to panic, so that the egress facilities cannot safely be reduced below those specified for ordinary hazard contents. (101:A.6.2.2.2)

A-2-1.77.3 Ordinary Hazard. Ordinary hazard classification represents the conditions found in most buildings and is the basis for the general requirements of NFPA 101.

The fear of poisonous fumes or explosions is necessarily a relative matter to be determined on a judgment basis. All smoke contains some toxic fire gases but, under conditions of ordinary hazard, there should be no unduly dangerous exposure during the period necessary to escape from the fire area, assuming there are proper exits. (101:A.6.2.2.3)

A-2-1.78 Health Care Occupancy. Health care occupancies include the following:

- (1) Ambulatory health care facilities
- (2) Hospitals
- (3) Limited care facilities
- (4) Nursing homes

Occupants of health care occupancies typically have physical or mental illness, disease, or infirmity. They also include infants, convalescents, or infirm aged persons. (101:A.3.3.134.7)

A-2-1.80 High-Rise Building. It is the intent of this definition that, in determining the level from which the highest occupiable floor is to be measured, the enforcing agency should exercise reasonable judgment, including consideration of overall accessibility to the building by fire department personnel and vehicular equipment. Where a building is situated on a sloping terrain and there is building access on more than one level, the enforcing agency might select the level that provides the most logical and adequate fire department access. (101:A.3.3.25.6)

A-2-1.81 Horizontal Exit. Horizontal exits should not be confused with egress through doors in smoke barriers. Doors in smoke barriers are designed only for temporary protection against smoke, whereas horizontal exits provide protection against serious fire for a relatively long period of time in addition to providing immediate protection from smoke. (See 7.2.4 of NFPA 101.) (101:A.3.3.61.1)

A-2-1.83 Hotel. So-called apartment hotels should be classified as hotels because they are potentially subject to the same transient occupancy as hotels. Transients are those who occupy accommodations for less than 30 days. (101:A.3.3.105)

A-2-1.87 Industrial Occupancy. Industrial occupancies include the following:

- (1) Dry cleaning plants
- (2) Factories of all kinds
- (3) Food processing plants
- (4) Gas plants
- (5) Hangars (for servicing/maintenance)
- (6) Laundries
- (7) Power plants
- (8) Pumping stations
- (9) Refineries

(10) Sawmills

(11) Telephone exchanges

In evaluating the appropriate classification of laboratories, the authority having jurisdiction should treat each case individually based on the extent and nature of the associated hazards. Some laboratories are classified as occupancies other than industrial; for example, a physical therapy laboratory or a computer laboratory. (101:A.3.3.134.8)

A-2-1.92 Limited Care Facility. Limited care facilities and residential board and care occupancies both provide care to people with physical and mental limitations. However, the goals and programs of the two types of occupancies differ greatly. The requirements in NFPA 101 for limited care facilities are based on the assumption that these are medical facilities, that they provide medical care and treatment, and that the patients are not trained to respond to the fire alarm; that is, the patients do not participate in fire drills but, rather, they await rescue. (See Section 18.7 of NFPA 101.)

The requirements for residential board and care occupancies are based on the assumption that the residents are provided with personal care and activities that foster continued independence, that the residents are encouraged and taught to overcome their limitations, and that most residents, including all residents in prompt and slow homes, are trained to respond to fire drills, to the extent they are able. Residents are required to participate in fire drills. (See Section 32.7 of NFPA 101.) (101:A.3.3.117)

A-2-1.93 Liquefied Natural Gas (LNG). At sufficiently low temperatures, natural gas liquefies. At atmospheric pressure, natural gas can be liquefied by reducing its temperature to approximately -260°F (-162°C). Upon release from containment to the atmosphere, LNG vaporizes and releases gas that, at ambient temperature, has about 600 times the volume of the liquid vaporized. Generally, at temperatures below approximately -170°F (-112°C), this gas is heavier than ambient air at 60°F (15°C). However, as its temperature rises, it becomes lighter than air.

The American Gas Association's *LNG Information Book* contains additional detailed information on the properties of methane and other hydrocarbons that constitute LNG. (57:A-1-6)

A-2-1.95 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A-2-1.101 Means of Egress. A means of egress comprises the vertical and horizontal travel and includes intervening room spaces, doorways, hallways, corridors, passageways, balconies, ramps, stairs, elevators, enclosures, lobbies, escalators, horizontal exits, courts, and yards. (101:A.3.3.121)

A-2-1.103 Mercantile Occupancy. Mercantile occupancies include the following:

- (1) Auction rooms
- (2) Department stores
- (3) Drugstores
- (4) Restaurants with fewer than 50 persons
- (5) Shopping centers
- (6) Supermarkets

Office, storage, and service facilities incidental to the sale of merchandise and located in the same building should be

considered part of the mercantile occupancy classification. (101:A.3.3.134.9)

A-2-1.111 Occupiable Story. Stories used exclusively for mechanical equipment rooms, elevator penthouses, and similar spaces are not occupiable stories. (101:A.3.3.194.1)

A-2-1.114 Organic Peroxide Formulation. Terms such as *accelerator*, *catalyst*, *initiator*, and so forth, are sometimes used to describe organic peroxide formulations. These terms are misleading because they can also refer to materials that are not or do not contain organic peroxides, some of which might present increased hazard when mixed with organic peroxides. (432:A-1-5)

A-2-1.117 Oxidizer. Any material that readily yields oxygen or other oxidizing gas, or that readily reacts to promote or initiate combustion of combustible materials. (430:A-1-5.13)

A-2-1.122 Personal Care. Personal care involves responsibility for the safety of the resident while inside the building. Personal care might include daily awareness by the management of the resident's functioning and whereabouts, making and reminding a resident of appointments, the ability and readiness for intervention in the event of a resident experiencing a crisis, supervision in the areas of nutrition and medication, and actual provision of transient medical care. (101:A.3.3.145)

A-2-1.134.2 Taxicab and Bus Repair Garages. Motor freight terminals are covered in NFPA 513, *Standard for Motor Freight Terminals*. (88B:A-1-3)

A-2-1.135 Residential Board and Care Occupancy. The following are examples of facilities that are classified as residential board and care occupancies:

- (1) A group housing arrangement for physically or mentally handicapped persons who normally attend school in the community, attend worship in the community, or otherwise use community facilities
- (2) A group housing arrangement for physically or mentally handicapped persons who are undergoing training in preparation for independent living, for paid employment, or for other normal community activities
- (3) A group housing arrangement for the elderly that provides personal care services but that does not provide nursing care
- (4) Facilities for social rehabilitation, alcoholism, drug abuse, or mental health problems that contain a group housing arrangement and that provide personal care services but do not provide acute care
- (5) Assisted living facilities
- (6) Other group housing arrangements that provide personal care services but not nursing care (101:A.3.3.134.13)

A-2-1.143 Smoke Barrier. A smoke barrier might be vertically or horizontally-aligned, such as a wall, floor, or ceiling assembly. A smoke barrier might or might not have a fire resistance rating. (101:A.3.3.20)

A-2-1.144 Smoke Compartment. In the provision of smoke compartments using the outside walls or the roof of a building, it is not intended that outside walls or roofs or any openings therein be capable of resisting the passage of smoke. (101:A.3.3.183)

A-2-1.149 Spray Area. For the purpose of NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*, the authority having jurisdiction can define the limits of the spray area in any specific case. The spray area in the vicinity of spray

application operations will necessarily vary with the design and arrangement of the equipment and with the method of operation. When spray application operations are strictly confined to predetermined spaces that are provided with adequate and reliable ventilation (such as a properly designed and constructed spray booth), the spray area will ordinarily not extend beyond this space. When spray application operations are not confined to an adequately ventilated space, then the spray area might extend throughout the room or building area where the spraying is conducted. (33:A-1-6)

A-2-1.154 Storage Occupancy. Storage occupancies include the following:

- (1) Barns
- (2) Bulk oil storage
- (3) Cold storage
- (4) Freight terminals
- (5) Grain elevators
- (6) Hangars (for storage only)
- (7) Parking structures
- (8) Stables
- (9) Truck and marine terminals
- (10) Warehouses

Storage occupancies are characterized by the presence of relatively small numbers of persons in proportion to the area. (101:A.3.3.134.14)

A-2-1.158 Street Floor. Where, due to differences in street levels, there are two or more stories accessible from the street, each is a street floor. Where there is no floor level within the specified limits for a street floor above or below ground level, the building has no street floor. (101:A.3.3.196)

A-2-1.159 Structure. The term *structure* is to be understood as if followed by the words *or portion thereof*. (See also *Building*, A-2-1.18.) (101:A.3.3.197)

A-3-1.4.2 Premises are deemed to be overcrowded when the occupant load exceeds the exit capacity or the posted occupant load.

A-3-2 The purpose of emergency egress and relocation drills is to educate the participants in the fire safety features of the building, the egress facilities available, and the procedures to be followed. Speed in emptying buildings or relocating occupants, while desirable, is not the only objective. Prior to an evaluation of the performance of an emergency egress and relocation drill, an opportunity for instruction and practice should be provided. This educational opportunity should be presented in a nonthreatening manner, with consideration to the prior knowledge, age, and ability of audience.

The usefulness of an emergency egress and relocation drill and the extent to which it can be performed depends on the character of the occupancy.

In buildings where the occupant load is of a changing character, such as hotels or department stores, no regularly organized emergency egress and relocation drill is possible. In such cases, the emergency egress and relocation drills are to be limited to the regular employees, who can, however, be thoroughly schooled in the proper procedure and can be trained to properly direct other occupants of the building in case of emergency evacuation or relocation. In occupancies such as hospitals, regular employees can be rehearsed in the proper procedure in case of fire; such training always is advisable in all occupancies whether or not regular emergency egress and relocation drills can be held. (101:A.4.7)

A-3-2.2 If an emergency egress and relocation drill is considered merely as a routine exercise from which some persons are allowed to be excused, there is a grave danger that, in an actual emergency, the evacuation and relocation will not be successful. However, there might be circumstances under which all occupants do not participate in an emergency egress and relocation drill; for example, infirm or bedridden patients in a health care occupancy. (101:A.4.7.2)

A-3-2.5 Fire is always unexpected. If the drill is always held in the same way at the same time, it loses much of its value. When, for some reason during an actual fire, it is not possible to follow the usual routine of the emergency egress and relocation drill to which occupants have become accustomed, confusion and panic might ensue. Drills should be carefully planned to simulate actual fire conditions. Not only should drills be held at varying times, but different means of exit or relocation areas should be used, based on an assumption that fire or smoke might prevent the use of normal egress and relocation avenues. (101:A.4.7.5)

A-3-5.5 Fire lanes should be kept clear of obstructions such as parked vehicles, fences and other barriers, dumpsters, excess vegetation, and so forth. However, it should be understood that a severe snowstorm can make these lanes temporarily inaccessible. In many parts of the country the annual snowfall is of such magnitude that alternative arrangements such as temporary roads over the snow accumulation can be necessary.

A-3-7.3 Figure A-3-7.3 shows an example of a stairway marking sign.

FIGURE A-3-7.3 Example of a stairway marking sign.



A-4-1.2 This provision prohibits the use of exit enclosures for storage or for installation of equipment not necessary for safety. Occupancy is prohibited other than for egress, refuge, and access. The intent is that the exit enclosure essentially be “sterile” with respect to fire safety hazards. (101:A.7.1.3.2.3)

A-4-1.3 An example of a use with the potential to interfere with egress is storage. (101:A.7.2.2.5.3)

A-4-1.6 Table A-4.1.6 gives a compilation of the interior finish requirements of the occupancy chapters of NFPA 101. (See pg. 1-149.)

A-4-1.8.1 Where doors are subject to two-way traffic, or where their opening can interfere with pedestrian traffic, an appropriately located vision panel can reduce the chance of accidents.

Swinging doors in horizontal or vertical rolling partitions complying with the following should be permitted in a means of egress where the following criteria are met:

- (1) The door or doors comply with 4-1.8.
- (2) The partition in which the doors are mounted complies with the applicable fire protection rating and closes upon smoke detection or power failure at a speed not exceeding 9 in./s (23 cm/s) and not less than 6 in./s (15 cm/s).
- (3) The doors mounted in the partition are self-closing or automatic-closing in accordance with 4-1.11. (101:A.7.2.1.4.1)

A-4-1.8.4 The requirement of 4-1.8.4 is not intended to apply to the swing of cross-corridor doors such as smoke barrier doors and horizontal exits. (101:A.7.2.1.4.4)

A-4-1.9.2 It is intended that the re-entry provisions apply only to enclosed exit stairs, not to outside stairs. This arrangement makes it possible to leave the stairway at such floor if the fire renders the lower part of the stair unusable during egress or if the occupants seek refuge on another floor. (101:A.7.2.1.5.2)

A-4-1.9.4 Examples of devices that might be arranged to release latches include knobs, levers, and panic bars. This requirement is permitted to be satisfied by the use of conventional types of hardware, whereby the door is released by turning a lever, knob, or handle or by pushing against a panic bar, but not by unfamiliar methods of operation such as a blow to break glass. The operating devices should be capable of being operated with one hand and should not require tight grasping, tight pinching, or twisting of the wrist to operate. (101:A.7.2.1.5.4)

A-4-1.9.6 Examples of devices prohibited by this requirement include locks, padlocks, hasps, bars, chains, or combinations thereof. (101:A.7.2.1.5.6)

A-4-1.10.1(d) In the event that the authority having jurisdiction has permitted increased operation time, the sign should reflect the appropriate time. [101:A.7.2.1.6.1(d)]

A-4-2.1 Exception No. 1. This exception provides for minimum widths for small spaces such as individual offices. The intent is that this exception applies to spaces formed by furniture and movable walls so that accommodations can easily be made for mobility-impaired individuals. One side of a path could be a fixed wall, provided that the other side is movable. This does not exempt the door widths or widths of fixed-wall corridors, regardless of the number of people or length.

Figure A-4.2.1 presents selected anthropometric data for adults. The male and female figures depicted in the figure are average, 50th percentile, in size. Some dimensions apply to very large, 97.5 percentile, adults (noted as 97.5 P). (101:A.7.3.4.1 Exception No. 1) (See pg. 1-150.)

A-4-4.2 Table A-4.4.2 is a compilation of the requirements of the individual occupancy chapters of NFPA 101 (Chapters 12 through 42) for permissible length of common path of travel, dead-end corridors, and travel distance to at least one of the required exits.

Table A-4-1.6 Interior Finish Limitations

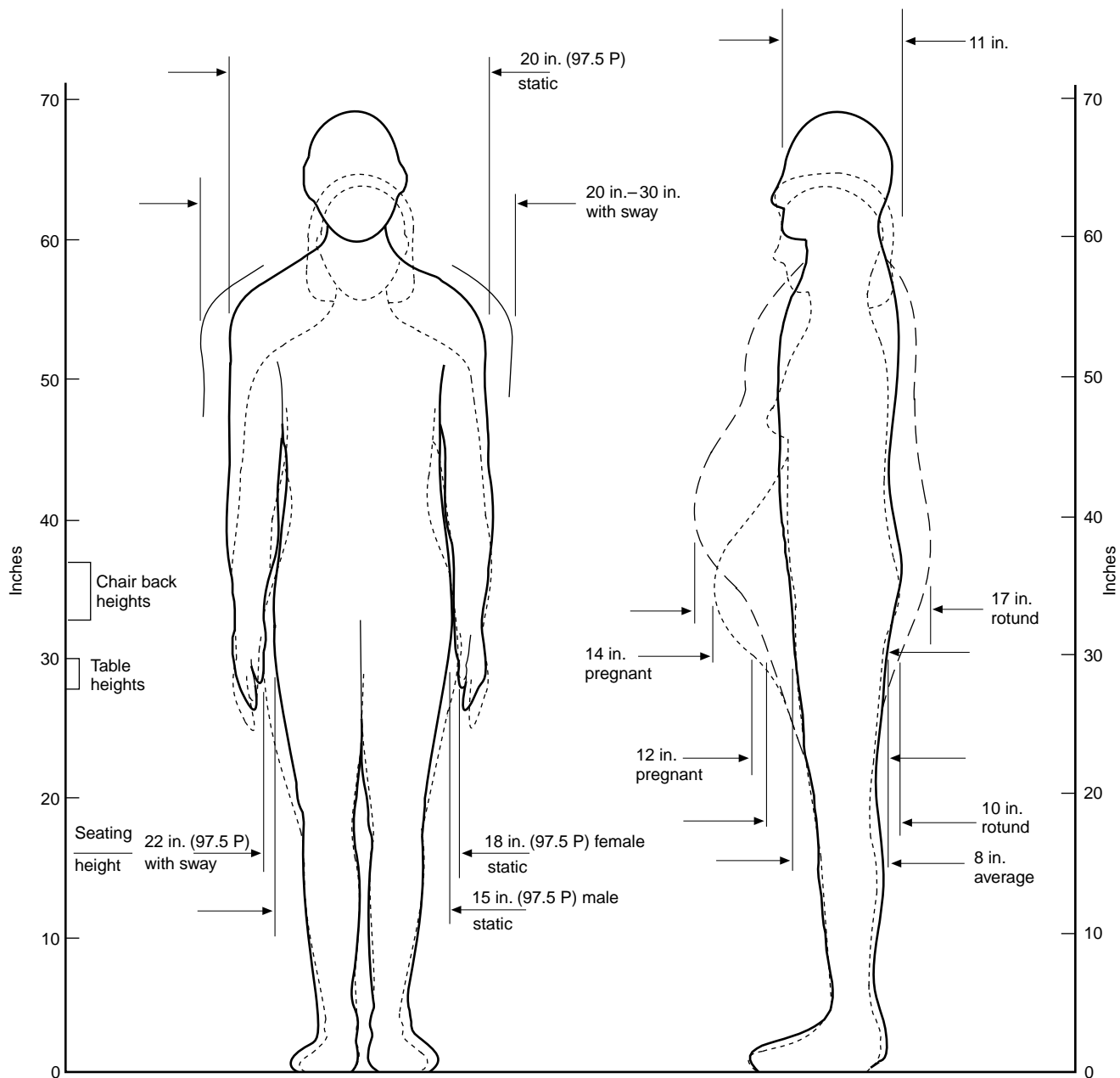
| Occupancy | Exits | Access to Exits | Other Spaces |
|---|----------------------|--|---|
| Assembly — New | | | |
| Class A or B | A | A or B | A or B |
| Class C | A | A or B | A, B, or C |
| Assembly — Existing | | | |
| Class A or B | A | A or B | A or B |
| Class C | A | A or B | A, B, or C |
| Educational — New | A | A or B | A or B |
| | | | C on low partitions [†] |
| Educational — Existing | A | A or B | A, B, or C |
| Day-care centers — New | A | A | A or B |
| | I or II | I or II | N.R. |
| Day-care centers — Existing | A or B | A or B | A or B |
| Group day-care homes — New | A or B | A or B | A, B, or C |
| Group day-care homes — Existing | A or B | A, B or C | A, B, or C |
| Family day-care homes | A or B | A, B, or C | A, B, or C |
| Health care — New automatic sprinklers mandatory | A or B | A or B | A or B |
| | | C on lower portion of corridor wall [†] | C in small individual rooms [†] |
| Health care — Existing | A or B | A or B | A or B |
| Detention and correctional — New | A [†] | A [†] | A, B, or C |
| | I | I | |
| Detention and correctional — Existing | A or B | A or B [†] | A, B, or C |
| | I or II | I or II | |
| Residential, hotels, and dormitories — New | A | A or B | A, B, or C |
| | I or II [†] | I or II [†] | |
| Residential, hotels, and dormitories — Existing | A or B | A or B | A, B, or C |
| | I or II [†] | I or II [†] | |
| Residential, apartment buildings — New | A | A or B | A, B, or C |
| | I or II [†] | I or II [†] | |
| Residential, apartment buildings — Existing | A or B | A or B | A, B, or C |
| | I or II | I or II | |
| Residential, 1-and 2-family, lodging or rooming houses | A, B, or C | A, B, or C | A, B, or C |
| Residential, board and care — See Chapters 22 and 23 of NFPA 101 | | | |
| Mercantile — New | A or B | A or B | A or B |
| Mercantile — Existing Class A or B | A or B | A or B | Ceilings — A or B Existing on walls — A, B, or C |
| Mercantile — Existing Class C | A, B, or C | A, B, or C | A, B, or C |
| Office — New | A or B | A or B | A, B, or C |
| | I or II | I or II | |
| Office — Existing | A or B | A or B | A, B, or C |
| Industrial | A or B | A, B, or C | A, B, or C |
| Storage | A or B | A, B, or C | A, B, or C |

[†]See Chapters in NFPA 101 for details.

Notes:

1. Class A interior wall and ceiling finish — flame spread 0–25, (new) smoke developed 0–450.
2. Class B interior wall and ceiling finish — flame spread 26–75, (new) smoke developed 0–450.
3. Class C interior wall and ceiling finish — flame spread 76–200, (new) smoke developed 0–450.
4. Class I interior floor finish — critical radiant flux, minimum 0.45 watts per cm².
5. Class II interior floor finish — critical radiant flux, minimum 0.22 watts per cm².
6. Automatic sprinklers — Where a complete standard system of automatic sprinklers is installed, interior wall and ceiling finish with flame spread rating not over Class C can be used in any location where Class B is required and with rating of Class B in any location where Class A is required; similarly, Class II interior floor finish can be used in any location where Class I is required and no critical radiant flux rating is required where Class II is required. This does not apply to new health care facilities.
7. Exposed portions of structural members complying with the requirements for heavy timber construction are permitted.

FIGURE A-4-2.1 Anthropometric data for adults; male and female figures of average, 50th percentile, size, some dimensions apply to very large, 97.5 percentile (97.5 P), adults. (101:Figure A.7.3.4.1)



A dead end exists where an occupant enters a corridor thinking there is an exit at the end and, finding none, is forced to retrace the path traveled to reach a choice of egress travel paths. Although relatively short dead ends are permitted by NFPA 101, it is better practice to eliminate them wherever possible, as they increase the danger of persons being trapped in case of fire. Compliance with the dead-end limits does not necessarily mean that the requirements for remoteness of exits have been met. Such lack of compliance is particularly true in small buildings or buildings with short public hallways. Adequate remoteness can be obtained in such cases by further

reducing the length of dead ends. (See also A-4-4.4.) (101:A.7.6.1)

A-4-4.4 The terms *dead end* and *common path of travel* are commonly used interchangeably. While the concepts of each are similar in practice, they are two different concepts.

A common path of travel exists where a space is arranged so that occupants within that space are able to travel in only one direction to reach any of the exits or to reach the point at which the occupants have the choice of two paths of travel to

remote exits. Part (a) of Figure A-44.4 is an example of a common path of travel.

While a dead end is similar to a common path of travel, a dead end can exist where there is no path of travel from an occupied space but can also exist where an occupant enters a corridor thinking there is an exit at the end and, finding none, is forced to retrace his or her path to reach a choice of exits. Part (b) of Figure A-44.4 is an example of such a dead-end arrangement.

Combining the two concepts, part (c) of Figure A-44.4 is an example of a combined dead-end/common path of travel problem.

Common paths of travel and dead-end travel are measured using the same principles used to measure travel distance as

described in Section 7.6 of NFPA 101. Starting in the room shown in part (d) of Figure A-44.4, measurement is made from the most remote point in the room, A, along the natural path of travel, and through the doorway along the centerline of the corridor to point C, located at the centerline of the corridor, which then provides the choice of two different paths to remote exits; this is common path of travel. The space between point B and point C is a dead end. (*See 2-1.40 for the definition of common path of travel.*) (101:A.7.5.1.6)

A4-6.1 Illumination provided outside the building should be to either a public way or a distance away from the building that is considered safe, whichever is closest to the building being evacuated. (101:A.7.8.1.1)

Table A-44.2 Common Path, Dead-End, and Travel Distance Limits (By Occupancy)

| Type of Occupancy | Common Path Limit | | Dead-End Limit | | Travel Distance Limit | |
|-----------------------------------|----------------------------------|----------------------------------|-------------------------|-----------------------|-------------------------|-------------------------|
| | Unsprinklered ft (m) | Sprinklered ft (m) | Unsprinklered ft (m) | Sprinklered ft (m) | Unsprinklered ft (m) | Sprinklered ft (m) |
| Assembly | | | | | | |
| New | 20/75 ^{a,b} (6.1/23) | 20/75 ^{a,b} (6.1/23) | 20 ^b (6.1) | 20 ^b (6.1) | 150 ^c (45) | 200 ^c (60) |
| Existing | 20/75 ^{a,b} (6.1/23) | 20/75 ^{a,b} (6.1/23) | 20 ^b (6.1) | 20 ^b (6.1) | 150 ^c (45) | 200 ^c (60) |
| Educational | | | | | | |
| New | 75 (23) | 75 (23) | 20 (6.1) | 20 (6.1) | 150 (45) | 200 (60) |
| Existing | 75 (23) | 75 (23) | 20 (6.1) | 20 (6.1) | 150 (45) | 200 (60) |
| New day-care center | N.R. ^{d,e} | N.R. ^{d,e} | 20 (6.1) | 20 (6.1) | 150 ^f (45) | 200 ^f (60) |
| Existing day-care center | N.R. ^{d,e} | N.R. ^{d,e} | 20 (6.1) | 20 (6.1) | 150 ^f (45) | 200 ^f (60) |
| Health Care | | | | | | |
| New | N.R. ^d | N.R. ^d | 30 (9.1) | 30 (9.1) | N.A. ^g | 200 ^f (60) |
| Existing | N.R. ^d | N.R. ^d | N.R. ^d | N.R. ^d | 150 ^f (45) | 200 ^f (60) |
| New ambulatory care | N.R. ^d | N.R. ^d | 30 (9.1) | 30 (9.1) | 150 ^f (45) | 200 ^f (60) |
| Existing ambulatory care | N.R. ^d | N.R. ^d | 50 (15) | 50 (15) | 150 ^f (45) | 200 ^f (60) |
| Detention and Correctional | | | | | | |
| New use conditions | | | | | | |
| II, III, IV | 50 (15) | 100 (30) | 50 (15) | 50 (15) | 150 ^f (45) | 200 ^f (60) |
| V | 50 (15) | 100 (30) | 20 (6.1) | 20 (6.1) | 150 ^f (45) | 200 ^f (60) |
| Existing use conditions | | | | | | |
| II, III, IV, V | 50 ^b (15) | 100 ^h (30) | N.R. | N.R. | 150 ^f (45) | 200 ^f (60) |
| Residential | | | | | | |
| Hotels and dormitories | | | | | | |
| New | 35 ⁱ (10.7) | 50 ⁱ (15) | 35 (10.7) | 50 (15) | 175 ^{f,j} (53) | 325 ^{f,j} (99) |
| Existing | 35 ⁱ (10.7) | 50 ⁱ (15) | 50 (15) | 50 (15) | 175 ^{f,j} (53) | 325 ^{f,j} (99) |
| Apartments | | | | | | |
| New | 35 ⁱ (10.7) | 50 ⁱ (15) | 35 (10.7) | 50 (15) | 175 ^{f,j} (53) | 325 ^{f,j} (99) |
| Existing | 35 ⁱ (10.7) | 50 ⁱ (15) | 50 (15) | 50 (15) | 175 ^{f,j} (53) | 325 ^{f,j} (99) |
| Board and care | | | | | | |
| Small, new and existing | N.R. ^d | N.R. ^d | N.R. ^d | N.R. ^d | N.R. ^d | N.R. ^d |
| Large, new | 35 ^k (10) | 35 ^k (10) | N.R. ^d | N.R. ^d | 175 ^{f,j} (53) | 325 ^{f,j} (99) |
| Large, existing | 35 (10) | 35 (10) | N.R. ^d | N.R. ^d | 175 ^{f,j} (53) | 325 ^{f,j} (99) |
| Lodging and rooming houses | N.R. ^d | N.R. ^d | N.R. ^d | N.R. ^d | N.R. ^d | N.R. ^d |
| One- and two-family dwellings | N.R. ^d | N.R. ^d | N.R. ^d | N.R. ^d | N.R. ^d | N.R. ^d |

(Sheet 1 of 2)

Table A-4.4.2 Common Path, Dead-End, and Travel Distance Limits (By Occupancy) (Continued)

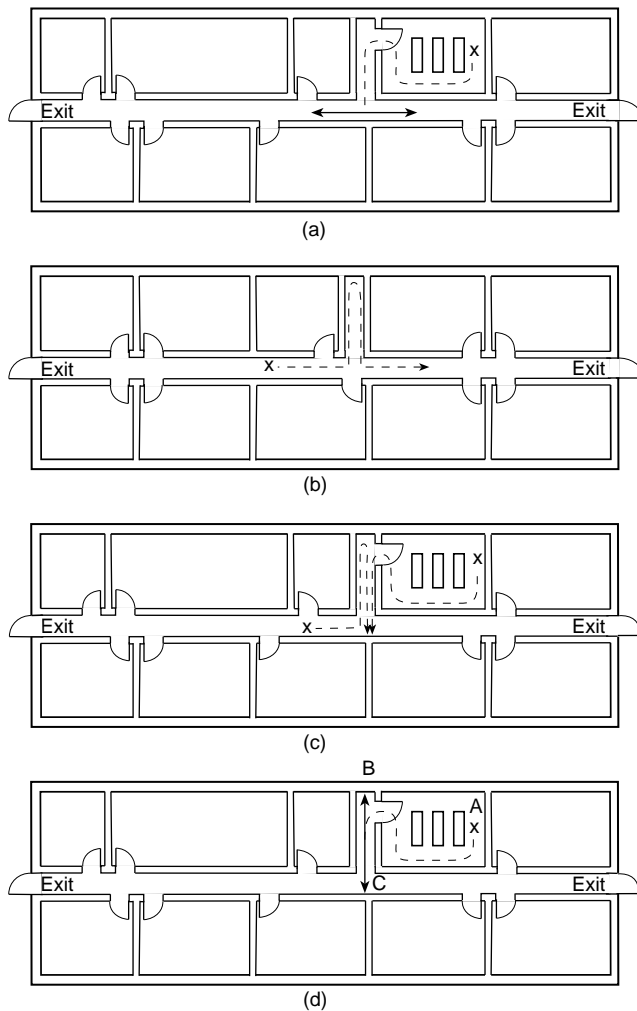
| Type of Occupancy | Common Path Limit | | Dead-End Limit | | Travel Distance Limit | |
|--|-------------------------|-----------------------|-------------------------|-----------------------|-------------------------|------------------------|
| | Unsprinklered ft (m) | Sprinklered ft (m) | Unsprinklered ft (m) | Sprinklered ft (m) | Unsprinklered ft (m) | Sprinklered ft (m) |
| Mercantile | | | | | | |
| Class A, B, C | | | | | | |
| New | 75 (23) | 100 (30) | 20 (6.1) | 50 (15) | 100 (30) | 200 (60) |
| Existing | 75 (23) | 100 (30) | 50 (15) | 50 (15) | 150 (45) | 200 (60) |
| Open air | N.R. ^d | N.R. ^d | 0 (0) | 0 (0) | N.R. ^d | N.R. ^d |
| Covered mall | | | | | | |
| New | 75 (23) | 100 (30) | 20 (6.1) | 50 (15) | 100 (30) | 400 ^l (120) |
| Existing | 75 (23) | 100 (30) | 50 (15) | 50 (15) | 150 (45) | 400 ^l (120) |
| Business | | | | | | |
| New | 75 ^m (23) | 100 ^m (30) | 20 (6.1) | 50 (15) | 200 (60) | 300 (91) |
| Existing | 75 ^m (23) | 100 ^m (30) | 50 (15) | 50 (15) | 200 (60) | 300 (91) |
| Industrial | | | | | | |
| General | 50 (15) | 50 (15) | 50 (15) | 50 (15) | 200 ⁿ (60) | 250 ⁿ (75) |
| Special purpose | 50 (15) | 50 (15) | 50 (15) | 50 (15) | 300 ^p (91) | 400 ^p (122) |
| High hazard | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 75 (23) | 75 (23) |
| Aircraft servicing hangars, ground floor | 50 ^p (15) | 50 ^p (15) | 50 ^p (15) | 50 ^p (15) | Note o | Note o |
| Aircraft servicing hangars mezzanine floor | 50 ^p (15) | 50 ^p (15) | 50 ^p (15) | 50 ^p (15) | 75 (23) | 75 (23) |
| Storage | | | | | | |
| Low hazard | N.R. ^d | N.R. ^d | N.R. ^d | N.R. ^d | N.R. ^d | N.R. ^d |
| Ordinary hazard | 50 (15) | 100 (30) | 50 (15) | 100 (30) | 200 (60) | 400 (122) |
| High hazard | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 75 (23) | 75 (23) |
| Parking garages, open | 50 (15) | 50 (15) | 50 (15) | 50 (15) | 200 (60) | 300 (91) |
| Parking garages, enclosed | 50 (15) | 50 (15) | 50 (15) | 50 (15) | 150 (45) | 200 (60) |
| Aircraft storage hangars, ground floor | 50 ^p (15) | 100 ^p (30) | 50 ^p (15) | 50 ^p (15) | Note o | Note o |
| Aircraft servicing hangars, mezzanine floor | 50 ^p (15) | 75 ^p (23) | 50 ^p (15) | 50 ^p (15) | 75 (23) | 75 (23) |
| Underground spaces in grain elevators | 50 ^p (15) | 50 ^p (15) | N.R. ^{d, p} | N.R. ^{d, p} | 200 (60) | 400 (122) |

(Sheet 2 of 2)

^a20 ft (6.1 m) for common path serving > 50 persons; 75 ft (23 m) for common path serving < 50 persons.^bSee Chapters 12 and 13 of NFPA 101 for special considerations for aisle accessways, aisles, and mezzanines.^cSee Chapters 12 and 13 of NFPA 101 for special considerations for smoke-protected assembly seating in arenas and stadia.^dNo requirement.^eSee Sections 14-7 and 15-7 of NFPA 101 for requirement for second exit access based on room capacity or area.^fThis dimension is for the total travel distance, assuming incremental portions have fully utilized their allowable maximums. For travel distance within the room, and from the room exit access door to the exit, see the appropriate occupancy chapter.^gNot applicable.^hSee Chapter 23 of NFPA 101 for special considerations for existing common paths.ⁱThis dimension is from the room/corridor or suite/corridor exit access door to the exit; thus it applies to corridor common path.^jSee appropriate occupancy chapter for special travel distance considerations for exterior ways of exit access.^kSee Section 32-3 of NFPA 101 for requirement for second exit access based on room area.^lSee Sections 36-4 and 37-4 of NFPA 101 for special travel distance considerations in covered malls considered pedestrian ways.^mSee Chapters 38 and 39 of NFPA 101 for special common path considerations for single tenant spaces.ⁿSee Chapter 40 of NFPA 101 for industrial occupancy special travel distance considerations.^oSee Chapters 40 and 42 of NFPA 101 for special requirements on spacing of door in aircraft hangars.^pSee Chapters 40 and 42 of NFPA 101 for special requirements if high hazard.

(101:Table A.7.6.1)

FIGURE A-4-4.4 Common paths of travel and dead-end corridors. (101: Figure A.7.5.1.6)



A-4-7 Emergency lighting provided outside the building should be to either a public way or a distance away from the building that is considered safe, whichever is closest to the building being evacuated. (101:A.7-9.1.1)

Table A-4-7 provides a summary of emergency lighting requirements from NFPA 101.

A-4-8.1 Where a main entrance serves also as an exit, it will usually be sufficiently obvious to occupants so that no exit sign is needed.

The character of the occupancy has a practical effect on the need for signs. In any assembly occupancy, hotel, department store, or other building subject to transient occupancy, the need for signs will be greater than in a building subject to permanent or semipermanent occupancy by the same people, such as an apartment house where the residents are presumed to be familiar with exit facilities by reason of regular use thereof. Even in a permanent residence-type building, how-

ever, there is need for signs to identify exit facilities such as outside stairs that are not subject to regular use during the normal occupancy of the building.

There are many types of situations where the actual need for signs is debatable. In cases of doubt, however, it is desirable to be on the safe side by providing signs, particularly as posting signs does not ordinarily involve any material expense or inconvenience.

The requirement for the locations of exit signs visible from any direction of exit access is illustrated in Figure A-4-8.1. (see pg. 1-155) (101:A.7.10.1.2)

A-4-8.3 In stores, for example, an otherwise adequate exit sign could be rendered inconspicuous by a high-intensity illuminated advertising sign located in the immediate vicinity.

Red is the traditional color for exit signs and is required by law in many places. However, at an early stage in the development of NFPA 101, a provision made green the color for exit signs, following the concept of traffic lights in which green indicates safety and red is the signal to stop. During the period when green signs were specified by NFPA 101, many such signs were installed, but the traditional red signs also remained. In 1949, the Fire Marshals Association of North America voted to request that red be restored as the required exit sign color, as it was found that the provision for green involved difficulties in law enactment that were out of proportion to the importance of safety. Accordingly, the 10th edition of NFPA 101 specified red where not otherwise required by law. The present text avoids any specific requirement for color on the assumption that either red or green will be used in most cases and that there are some situations in which a color other than red or green could actually provide better visibility. (101:A.7.10.1.7)

A-4-8.4.1 Experience has shown that the word EXIT or other appropriate wording is plainly legible at 100 ft (30 m) if the letters are as large as specified in 4-8.4.1. (101:A.7.10.6.1)

A-4-8.5 Illumination methods are defined as follows:

Electroluminescent. This light source is typically contained inside the device. (101:A.3.3.50)

Externally Illuminated. The light source is typically a dedicated incandescent or fluorescent source. (101:A.3.3.106)

Internally Illuminated. The light source is typically incandescent, fluorescent, electroluminescent, photo-luminescent, light-emitting diodes, or self-luminous. (101:A.3.3.107)

Self-Luminous. An example of a self-contained power source is tritium gas. Batteries do not qualify as a self-contained power source. The light source is typically contained inside the device. (101:A.3.3.175)

A-4-8.5.1 Some processes, such as manufacturing or handling of photosensitive materials, cannot be performed in areas provided with the minimum specified lighting levels. The use of spaces with lighting levels below 1 ft-candle (10 lux) might necessitate additional safety measures, such as written emergency plans, training of new employees in emergency evacuation procedures, and periodic fire drills. (101:A.7.8.1.3 Exception No. 2)

A-4-8.5.2 It is the intent to prohibit a freely accessible light switch to control the illumination of either an internally or externally illuminated exit sign. (101:A.7.10.5.2)

Table A-4-7 Summary of Emergency Lighting Requirements

| Occupancy | Emergency lighting | Exceptions |
|---|---|---|
| Assembly — new (8-2.9*) | All | Private party tents <1200 ft ² |
| Assembly — existing (9-2.9*) | All | Private party tents <1200 ft ² Class C used exclusively for religious worship |
| Educational (10-2.9*, 11-2.9*) | Interior stairs and corridors, normally occupied spaces, flexible and open plan, interior or windowless portions, shops, and labs | Exempted from normally occupied spaces are administrative areas, general classrooms, mechanical rooms, and storage rooms |
| Day-care occupancies (30-2.9*, 31-2.9*) | All | None |
| Health care — new (12-2.9*) | All — Life Safety Branch per NFPA 99 | None |
| Health care — existing (13-2.9*) | All | None |
| Ambulatory health care centers (12-6.2.9*, 13-6.2.9*) | All — essential electrical per NFPA 99 | Essential electrical not required if (a) battery equipment acceptable to the authority having jurisdiction or (b) life support equipment is for emergency purposes only |
| Detention and correctional (14-2.9*, 15-2.9*) | All | Existing permitted to have 1-hr duration |
| Hotels and dormitories (16-2.9*, 17-2.9*) | > 25 rooms | All rooms direct to grade |
| Apartment buildings (18-2.9*, 19-2.9*) | > 12 units or > 3 stories | All apartments direct to grade |
| Large board and care (22-3.2.9*, 23-3.2.9*) | > 25 rooms | All rooms direct to grade |
| Mercantile (24-2.9*, 25-2.9*) | All Class A and B All malls | None |
| Business — new (26-2.9*) | 2 stories above LED, or ≥50 people above or below LED, or ≥300 people total | None |
| Business — existing (27-2.9*) | 2 stories above LED, or ≥100 people above or below LED, or ≥1000 people total | None |
| Industrial (28-2.9*) | All | Special purpose without routine occupancy, or daylight operations with windows |
| Storage (29-2.9*, 29-8.2.9*) | All | Not normally occupied or daylight operation with windows |
| Windowless or underground (32-7.3.2*) | All | One-and two-family dwellings |

*Reference to paragraph in NFPA 101.

A-4-8.5.2 Exception. The flashing repetition rate should be approximately one cycle per second, and the duration of the off-time should not exceed $\frac{1}{4}$ second per cycle. During on-time, the illumination levels need to be provided in accordance with 7.10.6.3 of NFPA 101. Flashing signs, when activated with the fire alarm system, might be of assistance. (**101:A.7.10.5.2** Exception)

A-4-8.5.4 Photoluminescent signs need a specific minimum level of light on the face of the sign to ensure that the sign is charged for emergency operation and legibility in both the normal and emergency modes. Additionally, the type of light source (for example, incandescent, fluorescent, halogen, metal halide) is important. Each light source produces different types of visible and invisible light (for example, UV) that might affect the ability of some photoluminescent signs to charge and might also affect the amount of light output available during emergency mode. This type of sign would not be

suitable where the illumination levels are permitted to decline. The charging light source should not be connected to automatic timers, because the continuous illumination of the sign is needed; otherwise, the sign illumination would not be available because it would be discharged. (**101:A.7.10.7.2**)

A-4-8.6.1.1 A sign complying with 7.10.2 of NFPA 101 indicating the direction of the nearest approved exit should be placed at the point of entrance to any escalator or moving walk. (See A.7.10.3.) (**101:A.7.10.2**)

A-4-8.6.1.2 Figure A-4-8.6.1.2 shows examples of acceptable locations of directional indicators with regard to left and right orientation. Directional indicators are permitted to be placed under the horizontal stroke of the letter T, provided that the spacing of not less than $\frac{3}{8}$ in. (1 cm) is maintained from the horizontal and vertical strokes of the letter T. (**101:A.7.10.6.2**) (See pg. 1-155.)

FIGURE A-4-8.1 Location of exit signs.
(101:Figure A.7.10.1.2)

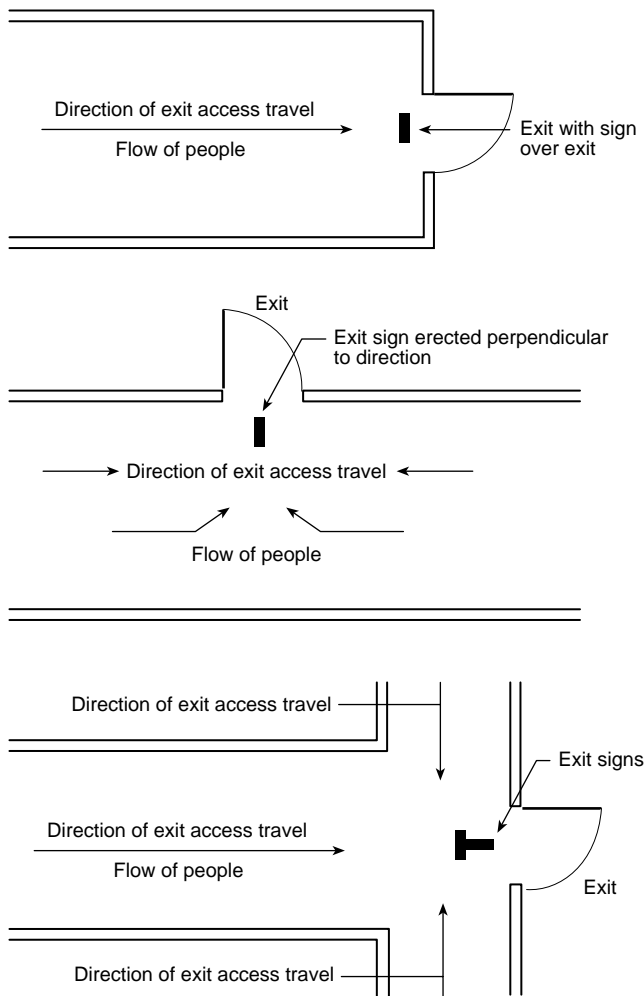


FIGURE A-4-8.6.1.2 Directional indicators. (101: Figure A.7.10.6.2)

EXIT>
<EXIT
<EXIT>

A-4-8.6.2 The likelihood of occupants mistaking passageways or stairways that lead to dead-end spaces for exit doors and becoming trapped governs the need for exit signs. Thus, such areas should be marked with a sign that reads as follows:

NO EXIT

Supplementary identification indicating the character of the area, such as TO BASEMENT, STOREROOM, LINEN CLOSET, or the like, is permitted to be provided. (See A.7.10.2 of NFPA 101.) (101:A.7.10.8.1)

A-4-9.1 A proper means of egress allows unobstructed travel at all times. Any type of barrier including, but not limited to, the accumulations of snow and ice in those climates subject to

such accumulations is an impediment to free movement in the means of egress. (101:A.7.1.10.1)

A-5-4.3 For requirements on the installation of incinerator doors, record room doors, and vault doors, see NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment*, and NFPA 232, *Standard for the Protection of Records*. For requirements on the installation of hoistway doors for elevators and dumbwaiters, see the applicable sections of ASME/ANSI A17.1, *Safety Code for Elevators and Escalators*, or CAN 3-B44, *Safety Code for Elevators*.

A-5-7.2 Exception. An architectural, exposed, suspended-grid acoustical tile ceiling with penetrations for sprinklers, ducted HVAC supply and return air diffusers, speakers, and recessed light fixtures is capable of limiting the transfer of smoke. (101:A.8.2.4.2)

A-5-7.3 Gasketing of doors should not be necessary as the clearances in NFPA 80, *Standard for Fire Doors and Fire Windows*, effectively achieve resistance to the passage of smoke if the doors are relatively tight fitting.

A-5-7.3.4 Gasketing of doors should not be necessary, as the clearances in NFPA 80, *Standard for Fire Doors and Fire Windows*, effectively achieve resistance to the passage of smoke if the door is relatively tight-fitting. (101:A.8.2.4.3.4)

A-5-7.4.3 An air transfer opening as defined in NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, is an opening designed to allow the movement of environmental air between two contiguous spaces. (101:A.8.2.4.4.3)

A-6-8 NFPA 92A, *Recommended Practice for Smoke-Control Systems*, provides guidance in implementing systems using pressure differentials to accomplish one or more of the following:

- (1) Maintain a tenable environment in the means of egress during the time required for evacuation
- (2) Control and reduce the migration of smoke from the fire area
- (3) Provide conditions outside the fire zone that assist emergency response personnel to conduct search and rescue operations and to locate and control the fire
- (4) Contribute to the protection of life and reduction of property loss

A-7-3.1.1 This Code contains requirements for automatic sprinkler protection that might not be required by other NFPA codes or standards. These requirements are included in this Code from a property protection standpoint in an effort to reduce property damage due to fire, as well as the costs of manual fire suppression in years to come.

A-7-3.2.3 Exception No. 2. It is the intent to permit a single multipurpose room of less than 12,000 ft² (1100 m²) to have certain small rooms as part of the single room. These rooms could be a kitchen, office, equipment room, and the like. It is also the intent that an addition could be made to an existing building without requiring that the existing building be sprinklered, if both the new and existing buildings have independent means of egress and a fire-rated separation is provided to isolate one building from the other.

A school gymnasium with egress independent of and separated from the school would be included in this exception as would a function hall attached to a church with a similar egress arrangement. (101:A.12.3.5 Ex.2)

A-7-3.2.7.1 In areas where the replenishment of water supplies is not immediately available from on-site sources, alternate provisions for the water-fill rate requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*, and NFPA 22, *Standard for Water Tanks for Private Fire Protection*, that are acceptable to the authority having jurisdiction should be provided. Appropriate means for the replenishment of these supplies from other sources, such as fire department tankers, public safety organizations, or other independent contractors should be incorporated into the overall fire safety plan of the facility.

With automatic sprinkler protection required throughout new health care facilities and quick-response sprinklers required in smoke compartments containing patient sleeping rooms, a fire and its life-threatening byproducts can be reduced, thereby allowing the defend-in-place concept to continue. The difficulty in maintaining the proper integrity of life safety elements has been considered and it has been judged that the probability of a sprinkler system operating as designed is equal to or greater than other life safety features. (101:A.18.3.5.1)

A-7-3.2.7.2 The requirements for use of quick-response sprinklers intend that quick-response sprinklers be the predominant type of sprinkler installed in the smoke compartment. It is recognized, however, that quick-response sprinklers might not be approved for installation in all areas such as those where NFPA 13, *Standard for the Installation of Sprinkler Systems*, requires sprinklers of the intermediate- or high-temperature classification. It is not the intent of the 18.3.5.2 of NFPA 101 requirements to prohibit the use of standard sprinklers in limited areas of a smoke compartment where intermediate- or high-temperature sprinklers are required.

Where the installation of quick-response sprinklers is impracticable in patient sleeping room areas, appropriate equivalent protection features acceptable to the authority having jurisdiction should be provided. It is recognized that the use of quick-response sprinklers might be limited in facilities housing certain types of patients or by the installation limitations of quick-response sprinklers. (101:A.18.3.5.2)

A-7-3.2.7.3 For the proper operation of sprinkler systems, cubicle curtains and sprinkler locations need to be coordinated. Improperly designed systems might obstruct the sprinkler spray from reaching the fire or might shield the heat from the sprinkler. Many options are available to the designer including, but not limited to, hanging the cubicle curtains 18 in. (46 cm) below the sprinkler deflector; using a 1/2-in. (1.3-cm) diagonal mesh or a 70 percent open weave top panel that extends 18 in. (46 cm) below the sprinkler deflector; or designing the system to have a horizontal and minimum vertical distance that meets the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*. The test data that forms the basis of the NFPA 13 requirements is from fire tests with sprinkler discharge that penetrated a single privacy curtain. (101:A.18.3.5.5)

A-7-3.2.8.2 It is intended that any valve that controls automatic sprinklers in the entire building or portions of the building, including sectional and floor control valves, be electrically supervised. Valves that control isolated sprinkler heads, such as in laundry and trash chutes, are not required to be electrically supervised. Appropriate means should be taken to ensure that valves that are not electrically supervised remain open. (101:A.19.3.5.2)

A-7-3.2.8.3 The exceptions to 7-3.2.8.3 are not intended to supplant NFPA 13, *Standard for the Installation of Sprinkler Systems*, which requires that residential sprinklers with more than a 10°F (5.6°C) difference in temperature rating not be mixed within a room. Currently there are no additional prohibitions in NFPA 13 on the mixing of sprinklers having different thermal response characteristics. Conversely, there are no design parameters to make practical the mixing of residential and other types of sprinklers. (101:A.19.3.5.3)

A-7-3.2.8.5 For the proper operation of sprinkler systems, cubicle curtains and sprinkler locations need to be coordinated. Improperly designed systems might obstruct the sprinkler spray from reaching the fire or might shield the heat from the sprinkler. Many options are available to the designer including, but not limited to, hanging the cubicle curtains 18 in. (46 cm) below the sprinkler deflector; using 1/2-in. (1.3-cm) diagonal mesh or a 70 percent open weave top panel that extends 18 in. (46 cm) below the sprinkler deflector; or designing the system to have a horizontal and minimum vertical distance that meets the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*. The test data that forms the basis of the NFPA 13 requirements is from fire tests with sprinkler discharge that penetrated a single privacy curtain. (101:A.19.3.5.5)

A-7-3.2.10.1 Where the openings in ceilings or partitions are 1/4 in. (0.6 cm) or larger in the smallest dimension, where the thickness or depth of the material does not exceed the smallest dimension of the openings, and where such openings constitute not less than 70 percent of the area of the ceiling or partition material, the disruption of sprinkler spray patterns is permitted to be disregarded. (101:A.23.3.5.2)

A-7-3.2.12.1 Although not required by NFPA 101, the use of residential sprinklers or quick-response sprinklers is encouraged for new installations of sprinkler systems within dwelling units, apartments, and guest rooms. Caution should be exercised, as the system needs to be designed for the sprinkler being used. (101:A.29.3.5.1)

A-7-3.2.14.1 Although not required by NFPA 101, the use of residential sprinklers or quick-response sprinklers is encouraged for new installations of sprinkler systems within dwelling units, apartments, and guest rooms. Caution should be exercised, as the system needs to be designed for the sprinkler being used. (101:A.31.3.5.1)

A-7-3.2.14.6 Exception No. 2. This system might consist of a combination of any or all of the following systems:

- (1) Partial automatic sprinkler protection
- (2) Smoke detection alarms
- (3) Smoke control
- (4) Compartmentation or other approved systems, or both (101:A.31.3.5.6)

A-7-3.2.15.1 The decision to permit the use of the criteria from NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, in these occupancies is based on the following:

- (1) The desire to obtain a level of fire suppression and control that is approximately equivalent to that delivered by residential facilities protected by such systems (see the appendix statement in NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*)

- (2) The fact that potential fire exposure and challenge to the suppression system in a small lodging and rooming occupancy is of the same nature and no more severe than that found in residences (**101:A.26.3.5.1**)

A-7-3.2.16.1.1 It is intended that this requirement apply to existing small facilities that are converted to large facilities.

Chapter 32 permits the use of NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, and NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, outside of their scopes. This permission is based on a review of the occupancy and a recognition that the fires in board and care facilities are similar to those of other residential occupancies and that the level of protection is appropriate. In some circumstances, such as those for impractical evacuation capabilities, the requirements of NFPA 13D and NFPA 13R have been supplemented with requirements for additional water supplies to compensate for the special needs of the board and care occupancy. (**101:A.32.3.3.5.1**)

A-7-3.2.16.2.2 The decision to allow the use of the criteria from NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, in these occupancies is based on (1) the desire of the Safety to Life Committee to obtain a level of fire suppression and control approximately the same as that delivered by residential facilities protected by such systems (see the appendix statement in NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*), and (2) the fact that potential fire exposure and challenge to the suppression system in a small board and care facility are of the same nature and no more severe than that found in residences. (**101:A.32.2.3.5.2**)

A-7-3.2.16.2.2 Exception No. 1. NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, states the following provisions for a multipurpose piping system.

A piping system serving both sprinkler and domestic needs shall be acceptable where:

(a) In common water supply connections serving more than one dwelling unit, 5 gpm (19 L/min) is added to the sprinkler system demand to determine the size of common piping and the size of the total water supply requirements.

(b) Smoke detectors are provided in accordance with NFPA 72, *National Fire Alarm Code*.

(c) All piping in the system conforms to the piping specifications of NFPA 13D.

(d) Permitted by the local plumbing or health authority. (**101:A.32.2.3.5.2 Ex. 1**)

A-7-3.2.17.1.1 It is intended that this requirement apply to existing small facilities that are converted to large facilities.

Chapter 33 permits the use of NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, and NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, outside of their scopes. This permission is based on a review of the occupancy and a recognition that the fires in board and care facilities are similar to those of other residential occupancies and that the level of protection is appropriate. In some circumstances, such as those for impractical evacuation capabilities, the requirements of NFPA 13D and NFPA 13R have been supplemented

with requirements for additional water supplies to compensate for the special needs of the board and care occupancy. (**101:A.33.3.3.5.1**)

A-7-3.2.17.2.1 The decision to permit the use of the criteria from NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, in these occupancies is based on the following:

- (1) The desire to obtain a level of fire suppression and control approximately equivalent to that delivered by residential facilities protected by such systems (see the appendix statement in NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*)
- (2) The fact that potential fire exposure and challenge to the suppression system in a small board and care facility are of the same nature and are no more severe than those found in residences.

Chapter 33 permits the use of NFPA 13D and NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, outside of their scopes. This permission is based on a review of the occupancy and a recognition that the fires in board and care facilities are similar to those of other residential occupancies and that the level of protection is appropriate. In some circumstances, such as those for impractical evacuation capabilities, the requirements of NFPA 13D and NFPA 13R have been supplemented with requirements for additional water supplies to compensate for the special needs of the board and care occupancy. (**101:A.33.2.3.5.2**)

A-7-3.2.21.2 The enabling legislation adopting this Code should specify a specific date for compliance with 7-3.2.21.2. Building owners and managers should be notified of this requirement within 180 days of code adoption. The following items should be considered by the authority having jurisdiction as guidance in evaluating compliance plans:

- (1) Shortage of qualified contractors to install sprinkler systems
- (2) Impact on owners and tenants as a result of existing conditions contained in lease agreements
- (3) Environmental constraints resulting from contaminated material being removed from limited areas of the building during installation of sprinklers and attendant activity
- (4) Available time to install sprinklers in the occupied spaces
- (5) Financial constraints of owners being able to fund the cost of installing automatic sprinklers with associated costs
- (6) Ability of the owner to coordinate general building remodeling with the actual sprinkler retrofit process

A-7-3.3.5 Testing of the waterflow alarm on wet pipe systems should be completed by opening the inspector's test connection. This simulates activation of a sprinkler. Where freezing weather conditions or other circumstances prohibit using the inspector's test connection, the bypass test connection may be permitted to be used. (**25:A-2-3.3**)

A-7-3.3.9 Corrosion-resistant or specially coated sprinklers should be installed in locations where chemicals, moisture, or other corrosive vapors exist. (**25:A-2-4.1.8**)

A-7-3.3.11 Conversion of dry pipe systems to wet pipe systems causes corrosion and accumulation of foreign matter in the pipe system and loss of alarm service. (**25:A-2-4.2**)

A-7-3.3.12 Where pressure-testing listed CPVC piping, the sprinkler systems should be filled with water and air should be bled from the highest and farthest sprinkler before test pressure is applied. Air or compressed gas should never be used for pressure-testing. (25:A-2-4.3)

A-7-4.1.3 A fire pump that is inoperative for any reason at any time constitutes an impairment to the fire protection system. It should be returned to service without delay.

Rain and intense heat of the sun are adverse conditions to equipment not installed in a completely protective enclosure. At a minimum, equipment installed outdoors should be shielded by a roof or deck. (20:A-2-7.1)

A-7-4.1.4 The centrifugal pump is particularly suited to boost the pressure from a public or private supply or to pump from a storage tank where there is a positive static head. (20:A-3-1.2)

A-7-4.1.6 Proper engine temperature when the engine is not running can be maintained through the circulation of hot water through the jacket or through heating of engine water by electric elements inserted into the block. As a general rule, water heaters and oil heaters are required for diesel engines below 70°F (21°C). The benefits to be gained are as follows:

- (1) Quick starting (fire pump engines may have to carry full load as soon as started)
- (2) Reduced engine wear
- (3) Reduced drain on batteries
- (4) Reduced oil dilution
- (5) Reduced carbon deposits, so that the engine is far more likely to start every time (20:A-8-6.5)

A-7-4.1.8 Isolation valves and control valves are considered to be identical when used in conjunction with a backflow prevention assembly. (20:A-2-11)

A-7-4.2.6 Pump rooms and pump houses should be dry and free of condensate. To accomplish a dry environment, heat can be required. (20:A-2-7.6)

A-7-4.3.1 If the controller must be located outside of the pump room, a glazed opening should be provided in the pump room wall for observation of the motor and pump during starting. The pressure-control pipeline should be protected against freezing and mechanical injury. (20:A-9-2.1)

A-7-4.3.3(3) The following trouble signals should be monitored remotely from the controller.

- (1) A common signal can be used for the following trouble indications: items in 9-4.1.3(a) through (e) of NFPA 20 and loss of output of battery charger on the load side of the dc overcurrent protective device.
- (2) If there is no other way to supervise loss of power, the controller can be equipped with a power failure circuit, which should be time delayed to start the engine upon loss of current output of the battery charger. [20:A-9-4.2(3)]

A-7-4.4.2 In addition, representatives of the installing contractor and owner should be present. (20:A-11-2.2)

A-7-4.5.3.1 Care should be taken to prevent water damage by verifying there is adequate drainage for the high pressure water discharge from hoses. (25:A-5-3.3.1)

A-7-4.5.3.1 Exception. Peak flow for a fire pump is 150 percent of the rated flow. Minimum flow for a pump is the churn pressure. (25:A-5-3.3.1)

A-7-4.5.5.2 Where comparing the test plot with the original acceptance test plot, it should be recognized that the acceptance test plot could exceed the minimum acceptable pump requirements as indicated by the rated characteristics for the pump. While a reduction in output is a matter of concern, this condition should be evaluated in light of meeting the rated characteristics for the pump. (See Figure A-5-3.5.2.) (25:A-5-3.5.2)

A-7-4.7.2 See NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, for proper maintenance of engine(s), batteries, fuel supply, and environmental conditions. (20:A-8-6.2)

A-7-4.7.5 It is important to provide proper bearing lubrication and to keep bearings clean. Some bearings are the sealed type and need no relubrication. Couplings with rubber drive parts do not need lubrication; other types generally do. The following practices are recommended:

- (a) Lubricant fittings should be cleaned before relubricating with grease.
- (b) The proper amount of lubricant should be used. Too much lubricant results in churning, causing excessive power loss and overheating.
- (c) The correct lubricant should be used.

Engine Maintenance. Engines should be kept clean, dry, and well lubricated. The proper oil level in the crankcase should be maintained.

Battery Maintenance. Only distilled water should be used in battery cells. Plates should be kept submerged at all times.

An automatic battery charger is not a substitute for proper maintenance of the battery and charger. Periodic inspection ensures that the charger is operating correctly, the water level in the battery is adequate, and the battery is holding its proper charge.

Fuel Supply Maintenance. The fuel storage tank should be kept at least two-thirds full. Fuel should be maintained free of water and foreign material by draining water and foreign material from the tank sump annually. This necessitates draining approximately 5 gal (19 L).

Temperature Maintenance. The temperature of the pump room, pump house, or area where engines are installed should never be less than the minimum recommended by the engine manufacturer. The manufacturer's temperature recommendations for water and oil heaters should be followed. (25:A-5-5.1)

A-7-5.3 The installation of backflow prevention devices on services supplying water to existing fire protection systems can result in excessive pressure losses. Therefore, installation of backflow prevention devices to protect public health must be accomplished with due regard for the implications on fire protection. The provisions of AWWA Manual 14, *Backflow Prevention and Cross Connection Control*, should be used as a guide for determining the appropriate protection for public health. Hydraulic calculations and water supply analysis should be conducted prior to installation to determine the impact on fire protection.

A-7-6.1.9 Acceptable means of identifying the fire extinguisher locations could include arrows, lights, signs, or coding of the wall or column. (10:A-1-6.6)

A-7-6.1.10 In situations where it is necessary that fire extinguishers be temporarily provided, a good practice is to provide portable stands, consisting of a horizontal bar on uprights with feet, on which the fire extinguishers can be hung. (10:A-1-6.7)

A-7-6.1.16 Vented fire extinguisher cabinets should utilize tinted glass and should be constructed to prevent the entrance of insects and the accumulation of water. Vented fire extinguisher cabinets constructed in this manner will lower the maximum internal temperature 10°F to 15°F (5.6°C to 8.3°C). (10:A-1-6.13)

A-7-6.1.17 The following precautions should be noted where fire extinguishers are located in areas that have temperatures outside the range of 40°F to 120°F (4°C to 49°C).

(a) AFFF and FFFP fire extinguishers cannot be protected against temperatures below 40°F (4°C) by adding an anti-freeze charge because it will tend to destroy the effectiveness of the extinguishing agent.

(b) Plain water fire extinguishers should not be protected against temperatures below 40°F (4°C) with ethylene glycol antifreeze. Calcium chloride solutions should not be used in stainless steel fire extinguishers.

(c) Fire extinguishers installed in machinery compartments, diesel locomotives, automotive equipment, marine engine compartments, and hot processing facilities can easily be subjected to temperatures above 120°F (49°C). Selection of fire extinguishers for hazard areas with temperatures above the listed limits should be made on the basis of recommendations by manufacturers of this equipment. (10:A-1-6.14)

A-7-6.1.18 The manual can be specific to the fire extinguisher involved or it can cover many types. (10:A-1-6.15)

A-7-6.2.1 Conditions of Selection.

(a) Physical Conditions that Affect Selection.

- (1) *Gross Weight.* In the selection of a fire extinguisher, the physical ability of the user should be contemplated. When the hazard exceeds the capability of a hand portable fire extinguisher, wheeled fire extinguishers or fixed systems (see Section 1-1) should be considered.
- (2) *Corrosion.* In some fire extinguisher installations, there exists a possibility of exposing the fire extinguisher to a corrosive atmosphere. Where this is the case, consideration should be given to providing the fire extinguishers so exposed with proper protection or providing fire extinguishers that have been found suitable for use in these conditions.
- (3) *Agent Reaction.* The possibility of adverse reactions, contamination, or other effects of an extinguishing agent on either manufacturing processes or on equipment, or both, should be considered in the selection of a fire extinguisher.
- (4) *Wheeled Units.* Where wheeled fire extinguishers are used, consideration should be given to the mobility of the fire extinguisher within the area in which it will be used. For outdoor locations, the use of proper rubber-tired or wide-rimmed wheel designs should be considered according to terrain. For indoor locations, the size of doorways and passages should be large enough to permit ready passage of the fire extinguisher.
- (5) *Wind and Draft.* If the hazard is subject to winds or draft, the use of fire extinguishers and agents having sufficient range to overcome these conditions should be considered.

(6) *Availability of Personnel.* Consideration should be given to the number of persons available to operate the fire extinguishers, the degree of training provided, and the physical capability of the operators.

(b) Health and Safety Conditions that Affect Selection. When a fire extinguisher is being selected, consideration should be given to the health and safety hazards involved in its maintenance and use, as described in items (1) through (8).

- (1) For confined spaces, prominent caution labels on the fire extinguisher, warning signs at entry points, provision for remote application, extra-long-range fire extinguisher nozzles, special ventilation, provision of breathing apparatus and other personal protective equipment, and adequate training of personnel are among the measures that should be considered.
- (2) Halogenated agent-type fire extinguishers contain agents whose vapor has a low toxicity. However, their decomposition products can be hazardous. When using these fire extinguishers in unventilated places, such as small rooms, closets, motor vehicles, or other confined spaces, operators and others should avoid breathing the gases produced by thermal decomposition of the agent.
- (3) Carbon dioxide fire extinguishers contain an extinguishing agent that will not support life when used in sufficient concentration to extinguish a fire. The use of this type of fire extinguisher in an unventilated space can dilute the oxygen supply. Prolonged occupancy of such spaces can result in loss of consciousness due to oxygen deficiency.
- (4) Fire extinguishers not rated for Class C hazards (e.g., water, antifreeze, soda acid, loaded stream, AFFF, FFFP, wetting agent, foam, and carbon dioxide with metal horns) present a shock hazard if used on fires involving energized electrical equipment.
- (5) Dry chemical fire extinguishers, when used in a small unventilated area, can reduce visibility for a period of up to several minutes. Dry chemical, discharged in an area, can also clog filters in air-cleaning systems.
- (6) A dry chemical fire extinguisher containing ammonium compounds should not be used on oxidizers that contain chlorine. The reaction between the oxidizer and the ammonium salts can produce an explosive compound (NCL₃).
- (7) Halon extinguishers should not be used on fires involving oxidizers, since they can react with the oxidizer.
- (8) Most fires produce toxic decomposition products of combustion, and some materials, upon burning, can produce highly toxic gases. Fires can also consume available oxygen or produce dangerously high exposure to convected or radiated heat. All of these can affect the degree to which a fire can be safely approached with fire extinguishers. (See *Bulletin of Research No. 53, "Survey of Available Information on the Toxicity of Combustion and Thermal Decomposition Products of Certain Building Materials Under Fire Conditions."*)

Table A-7-6.2.1 summarizes the characteristics of fire extinguishers and can be used as an aid in selecting fire extinguishers in accordance with Chapter 2 of NFPA 10. The ratings given are those that were in effect at the time that NFPA 10, *Standard for Portable Fire Extinguishers*, was prepared. Current listings should be consulted for up-to-date ratings. (10:A-2-1)

Table A-7-6.2.1 Characteristics of Extinguishers

| Extinguishing Agent | Method of Operation | Capacity | Horizontal Range of Stream | Approximate Time of Discharge | Protection Required below 40°F (4°C) | UL or ULC Classifications* |
|--------------------------------------|--------------------------------------|------------------------|----------------------------|-------------------------------|--------------------------------------|----------------------------|
| Water | Stored-pressure or pump | 2 1/2 gal | 30 to 40 ft | 1 min | Yes | 2-A |
| | Pump | 4 gal | 30 to 40 ft | 2 min | Yes | 3-A |
| Water (wetting agent) | Pump | 5 gal | 30 to 40 ft | 2 to 3 min | Yes | 4-A |
| | Stored-pressure | 1 1/2 gal | 20 ft | 30 sec | Yes | 2-A |
| | Carbon dioxide cylinder (wheeled) | 25 gal | 35 ft | 1 1/2 min | Yes | 10-A |
| | Carbon dioxide cylinder (wheeled) | 45 gal | 35 ft | 2 min | Yes | 30-A |
| | Carbon dioxide cylinder (wheeled) | 60 gal | 35 ft | 2 1/2 min | Yes | 40-A |
| Loaded stream | Stored-pressure or cartridge | 2 1/2 gal | 30 to 40 ft | 1 min | No | 2 to 3-A:1-B |
| | Carbon dioxide cylinder (wheeled) | 33 gal | 50 ft | 3 min | No | 20-A |
| AFFF, FFFP | Stored-pressure | 2 1/2 gal | 20 to 25 ft | 50 sec | Yes | 3-A:20 to 40-B |
| | Nitrogen cylinder | 33 gal | 30 ft | 1 min | Yes | 20-A:160-B |
| Carbon dioxide** | Self-expelling | 2 1/2 to 5 lb | 3 to 8 ft | 8 to 30 sec | No | 1 to 5-B:C |
| | Self-expelling | 10 to 15 lb | 3 to 8 ft | 8 to 30 sec | No | 2 to 10-B:C |
| | Self-expelling | 20 lb | 3 to 8 ft | 10 to 30 sec | No | 10-B:C |
| | Self-expelling | 50 to 100 lb (wheeled) | 3 to 10 ft | 10 to 30 sec | No | 10 to 20-B:C |
| Dry chemical (sodiumb carbonate) | Stored-pressure | 1 to 2 1/2 lb | 5 to 8 ft | 8 to 12 sec | No | 2 to 10-B:C |
| | Cartridge or stored-pressure | 2 3/4 to 5 lb | 5 to 20 ft | 8 to 25 sec | No | 5 to 20-B:C |
| | Cartridge or stored-pressure | 6 to 30 lb | 5 to 20 ft | 10 to 25 sec | No | 10 to 160-B:C |
| | Stored-pressure | 50 lb (wheeled) | 20 ft | 35 sec | No | 160-B:C |
| | Nitrogen cylinder or stored-pressure | 75 to 350 lb (wheeled) | 15 to 45 ft | 20 to 105 sec | No | 40 to 320-B:C |
| Dry chemical (potassium bicarbonate) | Cartridge or stored-pressure | 2 to 5 lb | 5 to 12 ft | 8 to 10 sec | No | 5 to 30-B:C |
| | Cartridge or stored-pressure | 5 1/2 to 10 lb | 5 to 20 ft | 8 to 20 sec | No | 10 to 80-B:C |
| | Cartridge or stored-pressure | 16 to 30 lb | 10 to 20 ft | 8 to 25 sec | No | 40 to 120-B:C |
| | Cartridge or stored-pressure | 48 to 50 lb (wheeled) | 20 ft | 30 to 35 sec | No | 120 to 160-B:C |

(Sheet 1 of 3)

Table A-7-6.2.1 Characteristics of Extinguishers (Continued)

| Extinguishing Agent | Method of Operation | Capacity | Horizontal Range of Stream | Approximate Time of Discharge | Protection Required below 40°F (4°C) | UL or ULC Classifications* |
|---|--------------------------------------|-------------------------|----------------------------|-------------------------------|--------------------------------------|---------------------------------------|
| Dry chemical (potassium chloride) | Nitrogen cylinder or stored-pressure | 125 to 315 lb (wheeled) | 15 to 45 ft | 30 to 80 sec | No | 80 to 640-B:C |
| | Cartridge or stored-pressure | 2 to 5 lb | 5 to 8 ft | 8 to 10 sec | No | 5 to 10-B:C |
| | Cartridge or stored-pressure | 5 to 9 lb | 8 to 12 ft | 10 to 15 sec | No | 20 to 40-B:C |
| | Cartridge or stored-pressure | 9½ to 20 lb | 10 to 15 ft | 15 to 20 sec | No | 40 to 60-B:C |
| | Cartridge or stored-pressure | 19½ to 30 lb | 5 to 20 ft | 10 to 25 sec | No | 60 to 80-B:C |
| | Cartridge or stored-pressure | 125 to 200 lb (wheeled) | 15 to 45 ft | 30 to 40 sec | No | 160-B:C |
| Dry chemical (ammonium phosphate) | Stored-pressure | 1 to 5 lb | 5 to 12 ft | 8 to 10 sec | No | 1 to 5-A [†] and 2 to 10-B:C |
| | Stored-pressure or cartridge | 2½ to 9 lb | 5 to 12 ft | 8 to 15 sec | No | 1 to 4-A and 10 to 40-B:C |
| | Stored-pressure or cartridge | 9 to 17 lb | 5 to 20 ft | 10 to 25 sec | No | 2 to 20-A and 10 to 80-B:C |
| | Stored-pressure or cartridge | 17 to 30 lb | 5 to 20 ft | 10 to 25 sec | No | 3 to 20-A and 30 to 120-B:C |
| | Stored-pressure or cartridge | 45 to 50 lb (wheeled) | 20 ft | 25 to 35 sec | No | 20 to 301-A and 80 to 160-B:C |
| | Nitrogen cylinder or stored-pressure | 110 to 315 lb (wheeled) | 15 to 45 ft | 30 to 60 sec | No | 20 to 40-A and 60 to 320-B:C |
| Dry chemical (foam compatible) | Cartridge or stored-pressure | 4¾ to 9 lb | 5 to 20 ft | 8 to 10 sec | No | 10 to 20-B:C |
| | Cartridge or stored-pressure | 9 to 27 lb | 5 to 20 ft | 10 to 25 sec | No | 20 to 30-B:C |
| | Cartridge or stored-pressure | 18 to 30 lb | 5 to 20 ft | 10 to 25 sec | No | 40 to 60-B:C |
| | Nitrogen cylinder or stored-pressure | 150 to 350 lb (wheeled) | 15 to 45 ft | 20 to 150 sec | No | 80 to 240-B:C |
| Dry chemical (potassium bicarbonate urea based) | Stored-pressure | 5 to 11 lb | 11 to 22 ft | 18 sec | No | 40 to 80-B:C |
| | Stored-pressure | 9 to 23 lb | 15 to 30 ft | 17 to 33 sec | No | 60 to 160-B:C |

(Sheet 2 of 3)

Table A-7-6.2.1 Characteristics of Extinguishers (Continued)

| Extinguishing Agent | Method of Operation | Capacity | Horizontal Range of Stream | Approximate Time of Discharge | Protection Required below 40°F (4°C) | UL or ULC Classifications* |
|--|-----------------------------------|---------------------------------------|----------------------------|-------------------------------|--------------------------------------|----------------------------|
| | | 175 lb (wheeled) | 70 ft | 62 sec | No | 480-B:C |
| Wet chemical | Stored-pressure | 6 L ¹ / ₂ gal | 8 to 12 ft | 35 to 45 sec | No | 1-B:C2-A:1-B:C |
| Halon 1211 (bromochlorodifluoromethane) | Stored-pressure | 0.9 to 2 lb | 6 to 10 ft | 8 to 10 sec | No | 1 to 2-B:C |
| | | 2 to 3 lb | 6 to 10 ft | 8 to 10 sec | No | 5-B:C |
| | | 5 ¹ / ₂ to 9 lb | 9 to 15 ft | 8 to 15 sec | No | 1-A:10-B:C |
| | | 13 to 22 lb | 14 to 16 ft | 10 to 18 sec | No | 2 to 4-A and 20 to 80-B:C |
| | | 50 lb | 35 ft | 30 sec | No | 10-A:120-B:C |
| | | 150 lb (wheeled) | 20 to 35 ft | 30 to 44 sec | No | 30-A:160 to 240-B:C |
| Halon 1211/1301 (bromochlorodifluoromethanebromotrifluoromethane) mixtures | Stored-pressure or self-expelling | 0.9 to 5 lb | 3 to 12 ft | 8 to 10 sec | No | 1 to 10-B:C |
| | Stored-pressure | 9 to 20 lb | 10 to 18 ft | 10 to 22 sec | No | 1-A:10-B:C to 4-A:80-B:C |
| Halocarbon type | Stored-pressure | 3 to 33 lb | 6 to 18 ft | 9 to 18 sec | No | 2B:C to 2A:10B:C |

(Sheet 3 of 3)

Note: Halon should be used only where its unique properties are deemed necessary.

*UL and ULC ratings checked as of July 24, 1987. Readers concerned with subsequent ratings should review the pertinent lists and supplements issued by these laboratories: Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062, or Underwriters Laboratories of Canada, 7 Crouse Road, Scarborough, Ontario, Canada M1R 3A9.

**Carbon dioxide extinguishers with metal horns do not carry a C classification.

†Some small extinguishers containing ammonium phosphate-based dry chemical do not carry an A classification. (10:Table A-2-1)

A-7-6.2.1.1 Halon agent is highly effective for extinguishing fire and evaporates after use, leaving no residue. Halon agent is, however, included in the Montreal Protocol list of controlled substances developed under the United Nations Environment Program. If agents other than halon can satisfactorily protect the hazard, they should be used instead of halon. Halon use should be limited to extinguishment of unwanted fire; halon should not be used for routine training of personnel. (10:A-2-1.1)

A-7-6.2.1.3 It is recommended that inverting types of fire extinguishers be replaced with currently available models. Manufacture of inverting types of fire extinguishers and their listing by Underwriters Laboratories Inc. was discontinued in 1969. As the availability of suitable replacement parts and recharge materials diminishes, it has become increasingly difficult to maintain these types of fire extinguishers in a safe and reliable operating condition. Inverting-type fire extinguishers (e.g., soda acid, foam, and cartridge-operated water) are now considered obsolete and are required to be removed from ser-

vice no later than the next required date for hydrostatic testing. (10:A-2-2.1.1)

A-7-6.2.1.5 The use of dry chemical fire extinguishers on wet energized electrical equipment (such as rain-soaked utility poles, high-voltage switch gear, and transformers) could aggravate electrical leakage problems. The dry chemical in combination with moisture provides an electrical path that can reduce the effectiveness of insulation protection. The removal of all traces of dry chemical from such equipment after extinguishment is recommended.

Carbon dioxide fire extinguishers equipped with metal horns are not considered safe for use on fires in energized electrical equipment and, therefore, are not classified for use on Class C hazards. (10:A-2-2.1.3)

A-7-6.2.1.6 Extinguishers and Extinguishing Agents for Class D Hazards.

(a) Chemical reaction between burning metals and many extinguishing agents (including water) can range from explo-

sive to inconsequential, depending in part on the type, form, and quantity of metal involved. In general, the hazards from a metal fire are significantly increased when such extinguishing agents are applied.

The advantages and limitations of a wide variety of commercially available metal fire extinguishing agents are discussed in Section 6, Chapter 26, of the NFPA *Fire Protection Handbook*. Consult the MSDS of the Class D hazard being protected or the extinguisher manufacturer.

(b) The agents and fire extinguishers discussed in this section are of specialized types, and their use often involves special techniques peculiar to a particular combustible metal. A given agent will not necessarily control or extinguish all metal fires. Some agents are valuable in working with several metals; others are useful in combating only one type of metal fire. The authorities having jurisdiction should be consulted in each case to determine the desired protection for the particular hazard involved.

(c) Certain combustible metals and reactive chemicals require special extinguishing agents or techniques. If there is doubt, applicable NFPA standards should be consulted or reference made to NFPA 49, *Hazardous Chemicals Data*, or NFPA 325, *Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids*.

(d) Reference should be made to the manufacturer's recommendations for use and special technique for extinguishing fires in various combustible metals.

(e) Fire of high intensity can occur in certain metals. Ignition is generally the result of frictional heating, exposure to moisture, or exposure from a fire in other combustible materials. The greatest hazard exists when these metals are in the molten state, in finely divided forms of dust, turnings, or shavings.

The properties of a wide variety of combustible metals and the agents available for extinguishing fires in these metals are discussed in Section 4, Chapter 16, and Section 6, Chapter 26, of the NFPA *Fire Protection Handbook*. (10:A-2-2.1.4)

A-7-6.3.1.2 If fire extinguishers intended for different classes of fires are grouped, their intended use should be marked conspicuously to aid in the choice of the proper fire extinguisher at the time of a fire. In an emergency, the tendency is to reach for the closest fire extinguisher. If this fire extinguisher is of the wrong type, the user could endanger himself or herself and the property he or she is endeavoring to protect. Wherever possible, it is preferable to have only those fire extinguishers available that can be safely used on any type of fire in the immediate vicinity. (10:A-3-1.2.2)

A-7-6.3.4 For dip tanks containing flammable or combustible liquids exceeding 150 gal (568 L) liquid capacity or having a liquid surface exceeding 4 ft² (0.38 m²), see NFPA 34, *Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids*, for requirements of automatic extinguishing facilities.

A-7-6.3.4.1 Where such personnel are not available, the hazard should be protected by fixed systems. (10:A-3-4.1)

A-7-6.3.5 Electrical equipment should be de-energized as soon as possible to prevent reignition. (10:A-3-5)

A-7-6.4.1.2 A fire equipment servicing agency is usually the most reliable means available to the public for having maintenance and recharging performed. Large industries could find it desirable to establish their own maintenance and recharge facilities, training personnel to perform these functions. Service manuals and parts lists should be obtained from the fire extinguisher manufacturer. (10:A-4-1.4)

A-7-6.4.1.3 Frequency of fire extinguisher inspections should be based on the need of the area in which fire extinguishers are located. The required monthly inspection is a minimum. An inspection should be more frequent if any of the following conditions exist:

- (1) High frequency of fires in the past
- (2) Severe hazards
- (3) Susceptibility to tampering, vandalism, or malicious mischief
- (4) Possibility of, or experience with, theft of fire extinguishers
- (5) Locations that make fire extinguishers susceptible to mechanical injury
- (6) Possibility of visible or physical obstructions
- (7) Exposure to abnormal temperatures or corrosive atmospheres
- (8) Characteristics of fire extinguishers, such as susceptibility to leakage (10:A-4-3.1)

A-7-6.4.2.3 Under special circumstances or where local requirements are in effect, additional information can be desirable or required on record tags. (10:A-4-4.4)

A-7-6.4.2.7(1) A condemned cylinder or fire extinguisher can only be destroyed by its owner or at the owner's direction. It is strongly recommended that a record be kept of cylinders or fire extinguishers that are recommended to be destroyed. (10:A-5-1.4)

A-7-7.2.5.2 Exception No. 3. A typical nurses' station would normally contain one or more of the following with associated furniture and furnishings:

- (1) Charting area
 - (2) Clerical area
 - (3) Nourishment station
 - (4) Storage of small amounts of medications, medical equipment and supplies, clerical supplies, and linens
 - (5) Patient monitoring and communication equipment
- (101:A.18.3.6.1 Ex. 3)

A-7-7.2.5.3 The requirement for smoke detectors in spaces open to the corridors eliminates the requirement contained in 18.3.6.1 of NFPA 101 for direct supervision by the facility staff of nursing homes. (101:A.18.3.4.5.3)

A-7-7.2.6.3 Exception No. 3. A typical nurses' station would normally contain one or more of the following with associated furniture and furnishings:

- (1) Charting area
 - (2) Clerical area
 - (3) Nourishment station
 - (4) Storage of small amounts of medications, medical equipment and supplies, clerical supplies, and linens
 - (5) Patient monitoring and communication equipment
- (101:A.19.3.6.1 Ex. 3)

A-7-7.2.6.3 Exception No. 6(b). A typical nurses' station would normally contain one or more of the following with associated furniture and furnishings:

- (1) Charting area
 - (2) Clerical area
 - (3) Nourishment station
 - (4) Storage of small amounts of medications, medical equipment and supplies, clerical supplies, and linens
 - (5) Patient monitoring and communication equipment
- [101:A.19.3.6.1 Ex. 3(b)]

A-7-7.2.6.3 Exception No. 7. This exception permits waiting areas to be located across the corridor from each other, provided that neither area exceeds the 600-ft² (55.7-m²) limitation. (101:A.19.3.6.1 Ex. 7)

A-7-7.2.7.2 Examples of contiguous common spaces are galleries and corridors. (101:A.22.3.4.4)

A-7-7.2.7.2.3 An open dormitory is a dormitory that is arranged to allow staff to observe the entire dormitory area at one time. (101:A.22.3.4.4.3)

A-7-7.2.8.2.3 An open dormitory is a dormitory that is arranged to allow staff to observe the entire dormitory area at one time. (101:A.23.3.4.4.3)

A-7-7.2.9.3 Caution needs to be exercised in locating smoke detectors with regard to their proximity to bathrooms, cooking facilities, and HVAC outlets in order to prevent nuisance alarms. (101:A.28.3.4.5)

A-7-7.2.11.2 Previous editions of NFPA 101 permitted the single-station smoke detector required by 30.3.4.5.1 of NFPA 101 to be omitted from each apartment where a complete automatic smoke detection system was installed throughout the building. With such a system, when one detector is activated, an alarm is sounded throughout the building. Experience with complete smoke detection systems in apartment buildings has shown that numerous nuisance alarms are likely to occur. Where there is a problem with frequent nuisance alarms, occupants ignore the alarm, or the system is either disconnected or otherwise rendered inoperative. (101:A.30.3.4.5.1)

A-7-7.2.16.1.2 Most often smoke alarms sounding an alarm at 85 dBA or greater, installed outside the bedroom area, will meet the intent of this requirement. Smoke alarms remotely located from the bedroom might not be loud enough to awaken the average person. In such cases, it is recommended that smoke alarms be interconnected so that the activation of any smoke alarm will cause all smoke alarms to activate. (101:A.33.2.3.4.3)

A-7-7.2.27.2.1 The need for voice communication can be based on a decision regarding staged or partial evacuation versus total evacuation of all floors. The determination of need is a function of occupancy classification and building height. (101:A.11.8.3.1)

A-7-7.3.1.1 Fire alarm system annunciation should, as a minimum, be sufficiently specific to identify the origin of a fire alarm signal in accordance with the following.

(a) If a floor exceeds 20,000 ft² (1860 m²) in area, the floor should be subdivided into detection zones of 20,000 ft² (1860 m²) or less, consistent with the existing smoke and fire barriers on the floor.

(b) If a floor exceeds 20,000 ft² (1860 m²) in area and is undivided by smoke or fire barriers, detection zoning should be determined on a case-by-case basis in consultation with the authority having jurisdiction.

(c) Waterflow switches on sprinkler systems that serve multiple floors, areas exceeding 20,000 ft² (1860 m²), or areas inconsistent with the established detection system zoning should be annunciated individually.

(d) In-duct smoke detectors on air-handling systems that serve multiple floors, areas exceeding 20,000 ft² (1860 m²), or areas inconsistent with the established detection system zoning should be annunciated individually.

(e) If a floor area exceeds 20,000 ft² (1860 m²), additional zoning should be provided. The length of any zone should not exceed 300 ft (91 m) in any direction. If the building is provided with automatic sprinklers throughout, the area of the alarm zone should be permitted to coincide with the allowable area of the sprinkler zone. (72:A-1-5.7.1.2)

A-7-7.3.2.1 The requirements of Chapter 7 should be used to perform the installation wiring and operational acceptance tests required when completing the record of completion.

The record of completion form shall be permitted to be used to record decisions reached prior to installation regarding intended system type(s), circuit designations, device types, notification appliance type, power sources, and the means of transmission to the supervising station. (72:A-1-6.2.1)

A-7-7.3.3.4 It is not the intent of 2-8.2.4 to require manual fire alarm boxes to be attached to moveable partitions or to equipment, nor to require the installation of permanent structures for mounting purposes only. (72:A-2-8.2.4)

A-7-7.3.3.5 Recommended coded signal designations for buildings that have four floors and multiple basements are provided in Table A-7-7.3.3.5. (72:A-2-8.3)

Table A-7-7.3.3.5 Recommended Coded Signal Designations

| Location | Coded Signal |
|--------------|--------------|
| Fourth floor | 2-4 |
| Third floor | 2-3 |
| Second floor | 2-2 |
| First floor | 2-1 |
| Basement | 3-1 |
| Sub-basement | 3-2 |

(72:Table A-2-8.3)

A-7-7.3.5.3 Though a trouble signal is required when a plug-in initiating device is removed from its base, it is not considered as a trouble condition within the device and the requirement of 7-7.3.5.2 shall not apply. (72:A-3-8.3.2.3.1)

A-7-7.3.6.5 The waterflow device should be field adjusted so that an alarm is initiated no more than 90 seconds after a sustained flow of at least 10 gpm (40 L/min).

Features that should be investigated to minimize alarm response time include the following:

- (1) Elimination of trapped air in the sprinkler system piping
- (2) Use of an excess pressure pump,
- (3) Use of pressure drop alarm-initiating devices
- (4) A combination thereof

Care should be used when choosing waterflow alarm-initiating devices for hydraulically calculated looped systems and those systems using small orifice sprinklers. Such systems might incorporate a single point flow of significantly less than 10 gpm (40 L/min). In such cases, additional waterflow alarm-initiating devices or the use of pressure drop-type waterflow alarm-initiating devices might be necessary.

Care should be used when choosing waterflow alarm-initiating devices for sprinkler systems that use on-off sprinklers to ensure that an alarm is initiated in the event of a waterflow

condition. On-off sprinklers open at a predetermined temperature and close when the temperature reaches a predetermined lower temperature. With certain types of fires, waterflow might occur in a series of short bursts of a duration of 10 seconds to 30 seconds each. An alarm-initiating device with retard might not detect waterflow under these conditions. An excess pressure system or a system that operates on pressure drop should be considered to facilitate waterflow detection on sprinkler systems that use on-off sprinklers.

Excess pressure systems can be used with or without alarm valves. The following is a description of one type of excess pressure system with an alarm valve.

An excess pressure system with an alarm valve consists of an excess pressure pump with pressure switches to control the operation of the pump. The inlet of the pump is connected to the supply side of the alarm valve, and the outlet is connected to the sprinkler system. The pump control pressure switch is of the differential type, maintaining the sprinkler system pressure above the main pressure by a constant amount. Another switch monitors low sprinkler system pressure to initiate a supervisory signal in the event of a failure of the pump or other malfunction. An additional pressure switch can be used to stop pump operation in the event of a deficiency in water supply. Another pressure switch is connected to the alarm outlet of the alarm valve to initiate a waterflow alarm signal when waterflow exists. This type of system also inherently prevents false alarms due to water surges. The sprinkler retard chamber should be eliminated to enhance the detection capability of the system for short duration flows. (72:A-2-6.2)

A-7-7.3.7.1 The provision of a double loop or other multiple path conductor or circuit to avoid electrical monitoring is not acceptable. (72:A-1-5.8.1)

A-7-7.3.7.1 Exception No. 7. NFPA 72, *National Fire Alarm Code*, does not have jurisdiction over monitoring integrity of conductors within equipment, devices, or appliances. (72:A-1-5.8.1 Exception No. 7)

A-7-7.3.8 A trouble signal is not required where operating power is being supplied by either of the two sources of power indicated in Exceptions No. 1 and No. 2, if they are capable of providing the hours of operation required by 1-5.2.6 of NFPA 72, *National Fire Alarm Code*, and loss of primary power is otherwise indicated (e.g., by loss of building lighting). (72:A-1-5.2.3)

A-7-7.4.2.4 Figure A-7-7.4.2.4 illustrates the proper mounting placement for detectors. (72:A-2-2.2.1)

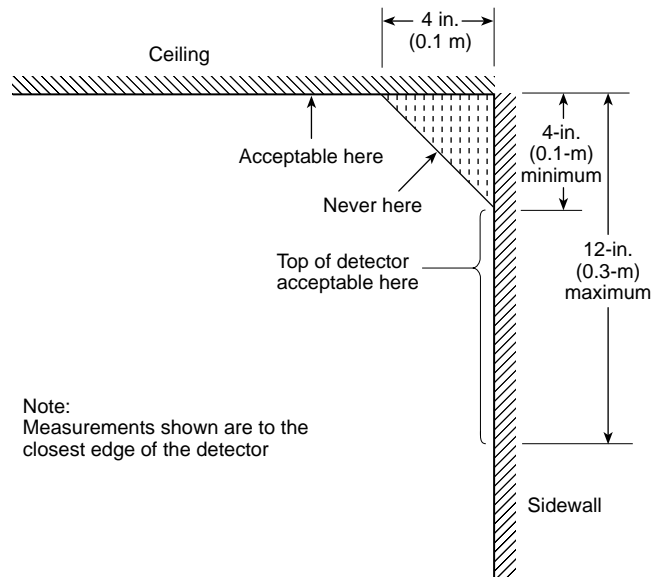
A-7-7.4.2.7 Figure A-7-7.4.2.7 illustrates under-floor mounting installations. (72:A-2-3.4.3.2)

A-7-7.4.4 Detectors that cause unwanted alarms should be tested at their lower listed range (or at 0.5 percent obscuration if unmarked or unknown). Detectors that activate at less than this level should be replaced. (72:A-7-3.2.1)

A-8-1.2.2 Exception No. 3(a). Securely supported altar candles in churches that are well separated from any combustible material are permitted. On the other hand, lighted candles carried by children wearing cotton robes present a hazard too great to be permitted. There are many other situations of intermediate hazard where the authority having jurisdiction

will have to exercise judgment. [101:A.12.7.2 Ex. 3(a); 101:A.13.7.2 Ex. 3(a)]

FIGURE A-7-7.4.2.4 Example of proper mounting for detectors. (72:Figure A-2-2.2.1)

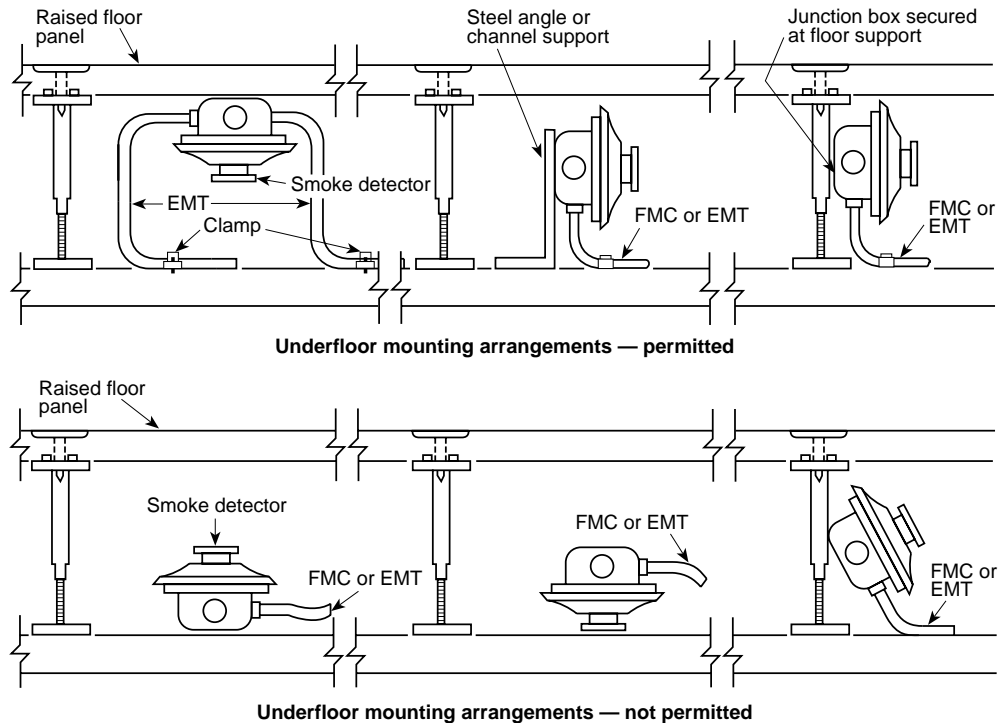


A-8-1.2.3.2 Testing per NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*, applies to textiles and films used in a hanging configuration. If the textiles and films are to be applied to surfaces of buildings or backing materials as interior finishes for use in buildings, they should be treated as interior wall and ceiling finishes in accordance with Section 10.2 of this *Code*, and they should then be tested for flame spread rating and smoke development values in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, or for flame spread and flash-over in accordance with NFPA 265, *Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Wall Coverings*.

The test results from NFPA 701 are suitable for classification purposes but should not be used as input into fire models, because they are not generated in units suitable for engineering calculations. (101:A.10.3.1)

A-8-1.2.3.3 Christmas trees not effectively flame-retardant treated, ordinary crepe paper decorations, and pyroxylin plastic decorations might be classified as highly flammable. (101:A.10.3.5)

A-8-1.2.5 The training program in crowd management should develop a clear appreciation of factors of space, energy, time, and information, as well as specific crowd management techniques such as metering. Published guidelines on these factors and techniques are found in the *SFPE Handbook of Fire Protection Engineering*, Section 3, Chapter 13. (101:A.12.7.5; 101:A.13.7.5)

FIGURE A-7-4.2.7 Mounting installations permitted (top) and not permitted (bottom). (72:Figure A-2-3.4.3.2)

A-8-2.2.1.1 The requirements are, of necessity, general in scope, as it is recognized that they apply to all types of educational occupancies as well as conditions of occupancies, such as truant schools; schools for the mentally handicapped, vision impaired, hearing impaired, and speech impaired; and public schools. It is fully recognized that no one code can meet all the conditions of the various buildings involved, and it will be necessary for site administrators to issue supplements to these requirements, but all supplements should be consistent with these requirements. (101:A.14.7.1.1; 101:A.15.7.1.1)

A-8-2.2.1.3 If an emergency egress and relocation drill is considered merely as a routine exercise from which some persons are allowed to be excused, there is a grave danger that, in an actual emergency, the evacuation and relocation will not be successful. However, there might be circumstances under which all occupants do not participate in an emergency egress and relocation drill; for example, infirm or bedridden patients in a health care occupancy. (101:A.4.7.2)

A-8-2.2.2.1 Particular attention should be given to keeping all doors unlocked; keeping doors that serve to protect the safety of paths of egress closed and under no conditions blocked open, such as doors on stairway enclosures; keeping outside stairs and fire escape stairs free from all obstructions and clear of snow and ice; and allowing no accumulation of snow or ice or materials of any kind outside exit doors that might prevent the opening of the door or interfere with rapid escape from the building.

Any condition likely to interfere with safe egress should be corrected immediately, if possible, or otherwise should be reported at once to the appropriate authorities. (101:A.14.7.2.1; 101:A.15.7.2.1)

A-8-2.2.3.2 Testing per NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*, applies to textiles and

films used in a hanging configuration. If the textiles and films are to be applied to surfaces of buildings or backing materials as interior finishes for use in buildings, they should be treated as interior wall and ceiling finishes in accordance with Section 10.2 of this Code, and they should then be tested for flame spread rating and smoke development values in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, or for flame spread and flash-over in accordance with NFPA 265, *Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Wall Coverings*.

The test results from NFPA 701 are suitable for classification purposes but should not be used as input into fire models, because they are not generated in units suitable for engineering calculations. (101:A.10.3.1)

A-8-2.2.3.3 Christmas trees not effectively flame-retardant treated, ordinary crepe paper decorations, and pyroxylin plastic decorations might be classified as highly flammable. (101:A.10.3.5)

A-8-3.3.2 The requirements are, of necessity, general in scope, as it is recognized that they apply to all types of day-care occupancies as well as conditions of occupancies, such as truant day-care occupancies; occupancies for the mentally handicapped, vision impaired, hearing impaired, and speech impaired; adult day-care; care of infants; and day-care occupancies. It is fully recognized that no one code can meet all the conditions of the various buildings involved, and it will be necessary for site administrators, through the written fire emergency response plan, to issue supplements to these requirements; however, all supplements should be consistent with these requirements. Additionally, it is recommended that fire safety be a part of the educational programs of the occupancy for clients.

Fire emergency response plans need to be written and made available to all employees, including temporary or substitute staff, so that all employees know what is expected of them during a fire emergency. The elements needed in the written plan should be identified in coordination with the authority having jurisdiction.

The facility fire emergency response plan might be a module of a facility disaster plan that covers other emergencies.

The proper safeguarding of clients during a fire emergency requires prompt and effective response by the facility employees in accordance with the fire emergency response plan. Duties covered under the plan should be assigned by position rather than by employee name. Such assignment ensures that, in the absence of an employee, the duties of the position will be performed by a substitute or temporary employee assigned to the position. Temporary or substitute employees should be instructed in advance regarding their duties under the plan for the position to which they are assigned.

Written fire emergency response plans should include, but should not be limited to, information for employees regarding methods and devices available for alerting occupants of a fire emergency. Employees should know how the fire department is to be alerted. Even where automatic systems are expected to alert the fire department, the written plan should provide for backup alerting procedures by staff. Other responses of employees to a fire emergency should include the following:

- (1) Removal of clients in immediate danger to areas of safety, as set forth in the plan
- (2) Methods of using building features to confine the fire and its byproducts to the room or area of origin
- (3) The control of actions and behaviors of clients during removal or evacuation activities and at predetermined safe assembly areas

The written plan should state clearly the facility policy regarding the actions staff are to take or not take to extinguish a fire.

The written fire emergency response plan should incorporate the emergency egress and relocation drill procedures set forth in 16.7.2 of NFPA 101. (101:A.16.7.1)

A-8-3.3.3.1.1 The requirements are, of necessity, general in scope, as it is recognized that they apply to all types of day-care occupancies as well as conditions of occupancies, such as truant day-care occupancies; day-care occupancies for the mentally handicapped, vision impaired, hearing impaired, and speech impaired. It is fully recognized that no one code can meet all the conditions of the various buildings involved, and it will be necessary for site administrators to issue supplements to these requirements, but all supplements should be consistent with these requirements. (101:A.16.7.2.1; 101:A.17.7.2.1)

A-8-3.3.3.1.3 If an emergency egress and relocation drill is considered merely as a routine exercise from which some persons are allowed to be excused, there is a grave danger that, in an actual emergency, the evacuation and relocation will not be successful. However, there might be circumstances under which all occupants do not participate in an emergency egress and relocation drill; for example, infirm or bedridden patients in a health care occupancy. (101:A.4.7.2)

A-8-3.3.3.1.6 Fire is always unexpected. If the drill is always held in the same way at the same time, it loses much of its value. When, for some reason during an actual fire, it is not possible to follow the usual routine of the emergency egress and relocation drill to which occupants have become accustomed, confusion and panic might ensue. Drills should be

carefully planned to simulate actual fire conditions. Not only should drills be held at varying times, but different means of exit or relocation areas should be used, based on an assumption that fire or smoke might prevent the use of normal egress and relocation avenues. (101:A.4.7.5)

A-8-3.3.4.2 Particular attention should be given to keeping all doors unlocked; keeping doors that serve to protect the safety of paths of egress closed and under no conditions blocked open, such as doors on stairway enclosures; keeping outside stairs and fire escape stairs free from all obstructions and clear of snow and ice; and allowing no accumulation of snow or ice or materials of any kind outside exit doors that might prevent the opening of the door or interfere with rapid escape from the building. (101:A.16.7.3.2; 101:A.17.7.3.2)

A-8-3.3.6 It is the intent that the requirement for adequate adult staff to be awake at all times when clients are present be applied to family day-care and group day-care homes that are operated at night, as well as day-care occupancies. (101:A.16.7.5; 101:A.17.7.5)

A-8-4.2.5.2 Testing per NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*, applies to textiles and films used in a hanging configuration. If the textiles and films are to be applied to surfaces of buildings or backing materials as interior finishes for use in buildings, they should be treated as interior wall and ceiling finishes in accordance with Section 10.2 of NFPA 101, and they should then be tested for flame spread rating and smoke development values in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, or for flame spread and flashover in accordance with NFPA 265, *Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Wall Coverings*.

The test results from NFPA 701 are suitable for classification purposes but should not be used as input into fire models, because they are not generated in units suitable for engineering calculations. (101:A.10.3.1)

A-8-5.2.4.1 Smoking regulations should include the following.

(a) Smoking should be prohibited in any room, compartment or area where flammable or combustible liquids, combustible gases, or oxygen is used or stored and in any other hazardous location. Such areas should be posted with signs that read NO SMOKING or the international symbol for no smoking. In residential board and care facilities where smoking is totally prohibited and signs so indicating are placed at all major entrances, secondary signs with language that prohibits smoking are not required.

(b) Smoking by residents classified as not responsible with regard to their ability to safely use and dispose of smoking materials should be prohibited. Where the resident is under direct supervision by staff or by a person approved by the administration, smoking might be permitted.

(c) Smoking materials should not be provided to residents or maintained by residents without the approval of the administration.

(d) Areas where smoking is permitted should be clearly identified.

(e) Ashtrays of noncombustible material and safe design should be provided and required to be used in all areas where smoking is permitted.

(f) Self-closing cover devices into which ashtrays can be emptied should be made available to all areas where smoking is permitted and should be required to be used. (101:A.32.7.4.1; 101:A.33.7.4.1)

A-8-5.2.5.3 New upholstered furniture within board and care homes should be tested for rates of heat release in accordance with 10.3.3 of NFPA 101. (**101:A.32.7.5.2**; **101:A.33.7.5.2**)

A-8-5.2.5.4 New mattresses within board and care homes should be tested for rates of heat release in accordance with 10.3.4 of NFPA 101. (**101:A.32.7.5.3**; **101:A.33.7.5.3**)

A-8-6.2.4 The most rigid discipline with regard to prohibition of smoking might not be nearly as effective in reducing incipient fires from surreptitious smoking as the open recognition of smoking, with provision of suitable facilities for smoking. Proper education and training of the staff and attendants in the ordinary fire hazards and their abatement is unquestionably essential. The problem is a broad one, varying with different types and arrangements of buildings; the effectiveness of rules of procedure, which need to be flexible, depends in large part on the management. (**101:A.20.7.4**; **101:A.21.7.4**)

A-8-7.2.1.2 This requirement is permitted to be met by electronic or oral monitoring systems, visual monitoring, call signals, or other means. (**101:A.22.7.1.2**; **101:A.23.7.1.2**)

A-8-7.2.1.3 Periodic, coordinated training should be conducted and should involve detention and correctional facility personnel and personnel of the fire department legally committed to serving the facility. (**101:A.22.7.1.3**; **101:A.23.7.1.3**)

A-8-8.2.5.1 In nonsprinklered hotels, dormitories, or apartment buildings, new upholstered furniture located in corridors or areas not separated from corridors by corridor walls, as specified in NFPA 101, should be tested in accordance with NFPA 261, *Standard Method of Test for Determining Resistance of Mock-Up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes*. The char length is not to exceed 1½ in. (3.8 cm) and should be labeled to indicate such compliance. (**101:A.28.3.3.4**; **101:A.29.3.3.4**)

A-8-15.2.1 The classification of plastics, elastomers, and rubber can be found in 2-2.4 of NFPA 13, *Standard for the Installation of Sprinkler Systems*.

A-8-15.5.2 See NFPA 232A, *Guide for Fire Protection for Archives and Records Centers*, where large archives or records storage buildings are involved.

A-8-17.2 See also NFPA 914, *Recommended Practice for Fire Protection in Historic Structures*.

A-9-1.2(1) An example of an aerosol product that is not flammable and, therefore, not covered by this code is whipped cream: the base product is a water-based material and the propellant is nitrous oxide, which is nonflammable. (**30B:A-1-1.2**)

A-9-1.2(2) See NFPA 58, *Liquefied Petroleum Gas Code*. (**30B:A-1-1.3**)

A-10-2.2.1 Building construction types are defined in NFPA 220, *Standard on Types of Building Construction*. The following material is extracted verbatim from NFPA 220, 1995 edition and is included here as a convenience for users of this Code. Any requests for Formal Interpretations (FIs) or Tentative Interim Amendments (TIAs) on the following material should

be directed to the Technical Committee on Building Construction.

3-1 Type I (443 or 332). Type I construction shall be that type in which the structural members, including walls, columns, beams, girders, trusses, arches, floors, and roofs, are of approved noncombustible or limited-combustible materials and shall have fire resistance ratings not less than those specified in Table 3-1.

3-2 Type II (222, 111, or 000). Type II construction shall be that type not qualifying as Type I construction in which the structural members, including walls, columns, beams, girders, trusses, arches, floors, and roofs, are of approved noncombustible or limited-combustible materials and shall have fire resistance ratings not less than those specified in Table 3-1.

3-3 Type III (211 or 200). Type III construction shall be that type in which exterior walls and structural members that are portions of exterior walls are of approved noncombustible or limited-combustible materials, and interior structural members, including walls, columns, beams, girders, trusses, arches, floors, and roofs, are entirely or partially of wood of smaller dimensions than required for Type IV construction or of approved noncombustible, limited-combustible, or other approved combustible materials. In addition, structural members shall have fire resistance ratings not less than those specified in Table 3-1.

3-4* Type IV (2HH).

3-4.1 Type IV construction shall be that type in which exterior and interior walls and structural members that are portions of such walls are of approved noncombustible or limited-combustible materials. Other interior structural members, including columns, beams, girders, trusses, arches, floors, and roofs, shall be of solid or laminated wood without concealed spaces and shall comply with the provisions of 3-4.2 through 3-4.6. In addition, structural members shall have fire resistance ratings not less than those specified in Table 3-1.

Exception No. 1: Interior columns, arches, beams, girders, and trusses of approved materials other than wood shall be permitted, provided they are protected to provide a fire resistance rating of not less than 1 hr.

Exception No. 2: Certain concealed spaces shall be permitted by the exception to 3-4.4.

3-4.2 Wood columns supporting floor loads shall be not less than 8 in. (203 mm) in any dimension; wood columns supporting roof loads only shall be not less than 6 in. (152 mm) in the smallest dimension and not less than 8 in. (203 mm) in depth.

3-4.3 Wood beams and girders supporting floor loads shall be not less than 6 in. (152 mm) in width and not less than 10 in. (254 mm) in depth; wood beams and girders and other roof framing, supporting roof loads only, shall be not less than 4 in. (102 mm) in width and not less than 6 in. (152 mm) in depth.

Table 3-1 Fire-Resistance Ratings (in Hours) for Type I Through Type V Construction

| | Type I | | Type II | | | Type III | | Type IV | Type V | |
|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | 443 | 332 | 222 | 111 | 000 | 211 | 200 | 2HH | 111 | 000 |
| Exterior Bearing Walls – | | | | | | | | | | |
| Supporting more than one floor, columns, or other bearing walls..... | 4 | 3 | 2 | 1 | 0 ¹ | 2 | 2 | 2 | 1 | 0 ¹ |
| Supporting one floor only..... | 4 | 3 | 2 | 1 | 0 ¹ | 2 | 2 | 2 | 1 | 0 ¹ |
| Supporting a roof only..... | 4 | 3 | 1 | 1 | 0 ¹ | 2 | 2 | 2 | 1 | 0 ¹ |
| Interior Bearing Walls – | | | | | | | | | | |
| Supporting more than one floor, columns, or other bearing walls..... | 4 | 3 | 2 | 1 | 0 | 1 | 0 | 2 | 1 | 0 |
| Supporting one floor only..... | 3 | 2 | 2 | 1 | 0 | 1 | 0 | 1 | 1 | 0 |
| Supporting roofs only..... | 3 | 2 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 |
| Columns – | | | | | | | | | | |
| Supporting more than one floor, columns, or other bearing walls..... | 4 | 3 | 2 | 1 | 0 | 1 | 0 | H ² | 1 | 0 |
| Supporting one floor only..... | 3 | 2 | 2 | 1 | 0 | 1 | 0 | H ² | 1 | 0 |
| Supporting roofs only..... | 3 | 2 | 1 | 1 | 0 | 1 | 0 | H ² | 1 | 0 |
| Beams, Girders, Trusses & Arches – | | | | | | | | | | |
| Supporting more than one floor, columns, or other bearing walls..... | 4 | 3 | 2 | 1 | 0 | 1 | 0 | H ² | 1 | 0 |
| Supporting one floor only..... | 3 | 2 | 2 | 1 | 0 | 1 | 0 | H ² | 1 | 0 |
| Supporting roofs only..... | 3 | 2 | 1 | 1 | 0 | 1 | 0 | H ² | 1 | 0 |
| Floor Construction | 3 | 2 | 2 | 1 | 0 | 1 | 0 | H ² | 1 | 0 |
| Roof Construction | 2 | 1½ | 1 | 1 | 0 | 1 | 0 | H ² | 1 | 0 |
| Exterior Nonbearing Walls | 0 ¹ | 0 ¹ | 0 ¹ | 0 ¹ | 0 ¹ | 0 ¹ | 0 ¹ | 0 ¹ | 0 ¹ | 0 ¹ |

Shaded areas represent those members that shall be permitted to be of approved combustible material.

¹Requirements for fire resistance of exterior walls, the provision of spandrel wall sections, and the limitation or protection of wall openings are not related to construction type. They need to be specified in other standards and codes, where appropriate, and may be required in addition to the requirements of NFPA 220, *Standard on Types of Building Construction*, for the construction type.

²"H" indicates heavy timber members; see NFPA 220, *Standard on Types of Building Construction*, for requirements.

3-4.4 Framed or glued laminated arches that spring from grade or the floor line and timber trusses that support floor loads shall be not less than 8 in. (203 mm) in width or depth. Framed or glued laminated arches for roof construction that spring from grade or the floor line and do not support floor loads shall have members not less than 6 in. (152 mm) in width and not less than 8 in. (203 mm) in depth for the lower half of the member height and not less than 6 in. (152 mm) in depth for the upper half of the member height. Framed or glued laminated arches for roof construction that spring from the top of walls or wall abutments and timber trusses that do not support floor loads shall have members not less than 4 in. (102 mm) in width and not less than 6 in. (152 mm) in depth.

Exception: Spaced members shall be permitted to be composed of two or more pieces not less than 3 in. (76 mm) in thickness where blocked solidly throughout their intervening spaces or where such spaces are tightly closed by a continuous wood cover plate not less than 2 in. (51 mm) in thickness, secured to the underside of the members.

Splice plates shall be not less than 3 in. (76 mm) in thickness.

3-4.5 Floors shall be constructed of splined or tongued and grooved plank not less than 3 in. (76 mm) in thickness that is covered with 1-in. (25-mm) tongue and groove

flooring, laid crosswise or diagonally to the plank, or with ½-in. (12.7-mm) plywood; or they shall be constructed of laminated planks not less than 4 in. (102 mm) in width, set close together on edge, spiked at intervals of 18 in. (457 mm), and covered with 1-in. (25-mm) tongue and groove flooring, laid crosswise or diagonally to the plank, or with ½-in. (12.7-mm) plywood.

3-4.6 Roof decks shall be constructed of splined or tongued and grooved plank not less than 2 in. (51 mm) in thickness; or of laminated planks not less than 3 in. (76 mm) in width, set close together on edge, and laid as required for floors; or of 1⅛-in. (28.6-mm) thick interior plywood (exterior glue); or of approved non-combustible or limited-combustible materials of equivalent fire durability.

NOTE: The dimensions used for sawn and glued laminated lumber in Section 3-4 are nominal dimensions.

3-5 Type V (111 or 000). Type V construction shall be that type in which exterior walls, bearing walls, columns, beams, girders, trusses, arches, floors, and roofs are entirely or partially of wood or other approved combustible material smaller than material required for Type IV construction. In addition, structural members shall have fire resistance ratings not less than those specified in Table 3-1. (415:A-2-1.1)

A-10-2.2.2 Furniture, floor and wall coverings, and other furnishings in airport terminal occupancies, including passenger holding lounges, waiting areas, restaurant dining rooms, bars, retail stores, etc., should not be made of materials that have high combustibility or smoke-development characteristics, or both. Examples of materials that have high combustibility or smoke-development characteristics, or both, include some plastic foams, latex-rubber foam, some plastics, and some synthetic fibers. Such materials have a tendency to release combustible gases at relatively low temperatures, making them easily ignitable. These materials also release high amounts of heat energy at rapid rates when burning, thereby contributing greatly to fire propagation. (415:A-2-1.2)

A-10-2.3.1 Examples of points of flammable vapor release are fuel tank vent openings and fuel hydrant pits. Air supply intake and exhaust openings for air conditioning or ventilating equipment serving the terminal building should not be located on the ramp side of an airport terminal building. Fixed air conditioning and ventilating equipment serving aircraft only should be in a room having no openings communicating with the remainder of the terminal building. (415:A-2-2.2)

A-10-2.3.2 Rooms containing coal-, gas-, or oil-fired equipment, or any room containing any other open flame device, should not have openings on the ramp side of the building. Combustion and ventilation air should be supplied from the street side or roof of the building or through a gravity louver from a nonhazardous area in the building. (415:A-2-2.3)

A-10-2.4 The hazards to persons from jet intakes and blast, noise, propellers, etc., on the ramp should be taken into consideration in locating emergency exit points leading to ramps from the airport terminal building. A means of notification of unauthorized usage (such as an alarm system) of these emergency exits may be desirable. (415:A-2-3.2)

A-10-3.5 For further information on exit principles, see NFPA 101, *Life Safety Code*. (418:A-3-4)

A-10-3.7.1 Where personnel trained in the operations of the equipment are in attendance, a hose line system is preferred.

The calculations used to develop the minimum extinguishing agent quantities and discharge rates presented in Table A-10-3.7.1(a) and (b) for rooftop heliports include the following factors:

(a) *Aircraft Size*. Reflects the potential level of risk, e.g., passenger load; the potential fire load, e.g., fuel capacity; and the dimensions, i.e., fuselage length and width, that allow the identification of a meaningful operational objective, i.e., the area to be rendered fire-free (controlled or extinguished).

(b) *Relative Effectiveness of Agent Selected*. Represented by the specific application rate identified for each of the common generic foam concentrate types.

(c) *Time Required to Achieve Control*. Large-scale fire tests, empirical data, and field experience indicate that 1 minute is both a reasonable and a necessary operational objective.

(d) *Time Required to Maintain Controlled Area Fire-Free*. An operational objective that provides a safety factor for the initial fire attack while waiting for the arrival of backup support.

The calculation method is supported by research and experimental work done mainly at the U.S. FAA's Technical Center. It was developed by the "Rescue and Firefighting Panel II" (RFFP II), a group of international experts in the field, convened by the International Civil Aviation Organization, Montreal Canada, circa 1970.

The RFFP II initially focused on the "Theoretical Critical Fire Area," which was identified in the FAA's large-scale fire tests as "... the area adjacent to the fuselage extending outward in all directions to a limit beyond which a large fuel fire would not melt an aluminum fuselage, regardless of the fire exposure time." For this concept to be useful, specific information about the size of the area was needed. Again, using the FAA Technical Center's work as a basis, the RFFP II's working definition of the Theoretical Critical Fire Area (TC) is "the area adjacent to an aircraft in which fire must be controlled." This definition implies control of the fire within a specific area. In order to achieve this, dimensions need to be determined. Formulas 1 and 2, which follow, were developed from that earlier work. Using these formulas, the size of the area of interest can be calculated. For example:

$$1. \quad \text{Where } L < 65 \text{ ft: } TC = L \times (40 \text{ ft} + W)$$

or

$$1a. \quad L < 20 \text{ m: } TC = L \times (12 \text{ m} + W)$$

and

$$2 \quad \text{Where } L > 65 \text{ ft: } TC = L \times (100 \text{ ft} + W)$$

or

$$2a. \quad L > 20 \text{ m: } TC = L \times (30 \text{ m} + W)$$

Where L = average aircraft length

W = average width of aircraft served at the airport of interest.

Conceptually, the TC serves as a means for assessing the magnitude of the potential fire hazard of the aircraft accident environment. It *does not represent* the average, maximum, or minimum spill fire size associated with a particular aircraft. However, it does represent a starting point for determining realistic fire extinguishing agent requirements. The formulas allow for the calculation of the TC area for different sizes of aircraft. They are widely accepted throughout the aircraft fire service community and are applied as described in the following paragraphs.

A 1970 study concluded that in survivable aircraft crashes a "practical fire area" should be considered that was smaller than the "theoretical area." Detailed criteria for the practical fire area and the related quantities of extinguishing agents were formulated during the second meeting of the RFFP II. In developing its material, the panel's work included a study of the quantities of agents used on actual fires. In 99 out of 106 such fires, the quantities of agents used were less than those recommended by the theoretical critical fire area calculations.

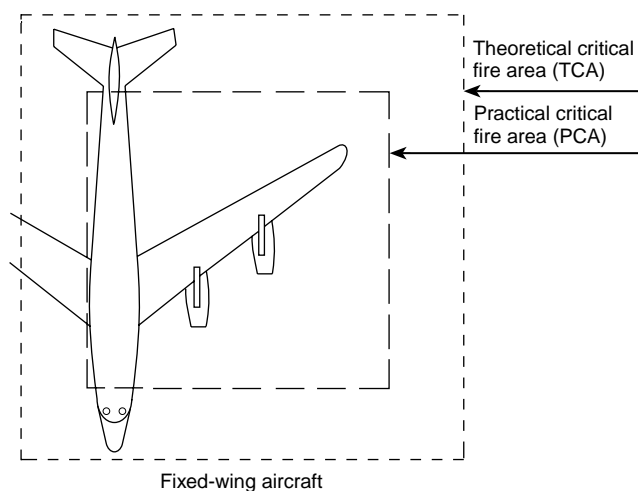
As a result, RFFP II developed material recommending that the practical area be approximately two-thirds the theoretical area [see Figure A-10-3.7.1(a)]. This principle has been adopted by the ICAO, the NFPA, and the U.S. FAA in the development of tables that show extinguishing agent volumes for their respective standards and recommended practices. The practical critical fire area (PC) for fixed-wing aircraft is commonly expressed as follows:

$$3. \quad (\text{practical critical fire area}) = (0.67) \times (\text{theoretical critical fire area})$$

or

$$3a. \quad PC = (0.67) (TC)$$

FIGURE A-10-3.7.1(a) Practical critical fire area relative to theoretical critical fire area. [418: Figure A-3-6.1(a)]



In adapting the fixed-wing fire protection methodology to helicopters, the committee considered the following additional factors that make the fire protection problem of helicopters (rotary-wing aircraft) unique:

- (a) *Occupied Space.* Relative to its fixed-wing counterpart, a smaller portion of the overall aircraft length is occupied.
- (b) *Fuel Quantities and Location.* Fuel tanks are not located in the “wings” or rotor blades, and relatively small quantities of fuel are involved.
- (c) *Impact Energy.* Relative to the fixed-wing counterpart, a helicopter accident generally occurs at slow ground speeds.
- (d) *Expected Aircraft Size.* In general, heliports are designed for the largest helicopter expected to utilize the facility, not the median size for the category. [See Tables A-10-3.7.1(a) and (b).]

After considering both the factors involved in the fixed-wing methodology and those factors that are unique to helicopters, the committee arrived at a “Theoretical Critical Area” for helicopters that includes a longitudinal dimension of half the overall length of the helicopter and a width equal to three times the fuselage width. In addition, in the absence of any data that suggested a more appropriate alternative, the “practical critical fire area” has been determined to be 100 percent of the “theoretical critical area.” [See Figure A-10-3.7.1(b).]

Another established principle is the distinction between control and extinguishment of a fire. Test data and a wide range of field experience indicate that the quantities of foam agent needed to control and extinguish an aircraft fire should be determined separately. This principle is expressed in items 1 through 6 as follows:

1. Where Q_1 = Volume of agent needed for 1-minute control of PC
and
2. Q_2 = Volume of agent needed for continued control or complete extinguishment of fire related to PC, or both.

3. Therefore: $Q = Q_1 + Q_2$ = Minimum agent volume for effective fire service operations.

The relationship between Q_1 and Q_2 as they were developed by the committee that studied the fixed-wing fire protection problem is as follows:

4. Q_1 = (application rate) \times (practical critical area)

or

$$4a. Q_1 = (AR)(PC) \quad \text{Where the “application rate” is the unit volume of agent applied to a unit area of fire in a unit time; the exact units such as gpm/ft}^2 \text{ or lpm/m}^2 \text{ depend on the units convention being used.}$$

5. $Q_2 = f(Q_1)$ And it has been determined that, for all categories of heliports, $f = 1$.

6. Therefore: $Q = 2[(AR)(PC)]$

A sample calculation of the total water quantity, Q , needed where aqueous film-forming foam concentrate is to be used at each of the three categories of heliport is provided in Tables A-10-3.7.1(a) and (b). A similar set of water quantities can be calculated for any other foam concentrate for which an accepted application rate is known. The value for the AFFF application rate in column 5 of Tables A-10-3.7.1(a) and (b) is substituted and the indicated calculations are performed to obtain the value of Q for the specific foam concentrate to be used.

FIGURE A-10-3.7.1(b) Practical critical fire area for helicopters. [418: Figure A-3-6.1(b)]

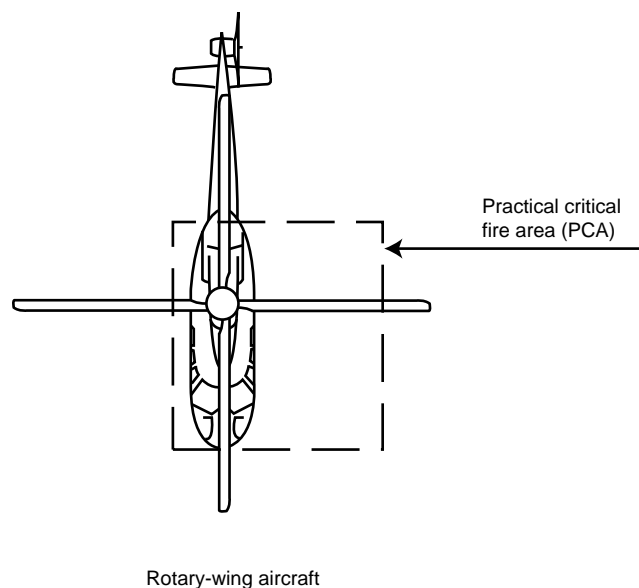


Table A-10-3.7.1(a) Method to Determine Helicopter Critical Fire Area and Required Minimum Amount of Water for a Hose Line (AFFF) System

| NFPA/ICAO Heliport Category | | | | ¹ / ₂ × O.L. of Largest Helicopter ¹ | | Fuselage Width Tripled ² | | Crital Fire Area | | Application Rate (gpm/ft ²) | | Q ₁ Water to Control within 1 Min | | Q ₂ Reserve to Extinguish | | Q Total Water to Extinguish | |
|-----------------------------------|-------|---|--------|---|---|---|---|----------------------|---|---|---|--|---|--|---|-----------------------------------|--|
| H-1 | 0 ft | < | 50 ft | 25 ft | × | 15 ft | = | 375 ft ² | × | 0.10 | = | 37.5 U.S. gal | + | 100% | = | 75 U.S. gal | |
| H-2 | 50 ft | < | 80 ft | 40 ft | × | 21 ft | = | 840 ft ² | × | 0.10 | = | 84 U.S. gal | + | 100% | = | 168 U.S. gal | |
| H-3 | 80 ft | < | 120 ft | 60 ft | × | 24 ft | = | 1440 ft ² | × | 0.10 | = | 144 U.S. gal | + | 100% | = | 288 U.S. gal | |

¹O.L. = Overall length, measured from tip of main rotor fully extended to tip of tail rotor fully extended.²Fuselage width = Actual fuselage width (does not include landing gear) measured from outside of cabin.**Table A-10-3.7.1(b) Method to Determine Helicopter Critical Fire Area and Required Minimum Amount of Water for a Hose Line (AFFF) System**

| | | | | | | | | | | Application | | | | | | | |
|-----------------------------------|--------|----------|---|---|-------|---|----------------------|----------------------------------|-----|--------------------------------------|---------|--|------|--|---------|-----------------------------------|--|
| NFPA/ICAO Heliport Category | | | $\frac{1}{2} \times \text{O.L.}$ of Largest Helicopter ¹ | | | Fuselage Width Tripled ² | | Practical Crital Fire Area | | Rate [(L/ min)m ²] | | Q ₁ Water to Control within 1 Min | | Q ₂ Reserve to Extinguish | | Q Total Water to Extinguish | |
| H-1 | 0 m | < 15.2 m | 7.6 m | × | 4.6 m | = | 34.8 m ² | × | 4.1 | = | 141.9 L | + | 100% | = | 283.9 L | | |
| H-2 | 15.2 m | < 24.4 m | 12.2 m | × | 6.4 m | = | 78.0 m ² | × | 4.1 | = | 317.9 L | + | 100% | = | 635.9 L | | |
| H-3 | 24.4 m | < 36.6 m | 18.3 m | × | 7.3 m | = | 133.8 m ² | × | 4.1 | = | 545.0 L | + | 100% | = | 1090 L | | |

¹O.L. = Overall length, measured from tip of main rotor fully extended to tip of tail rotor fully extended.²Fuselage width = Actual fuselage width (does not include landing gear) measured from outside of cabin.

To fully appreciate the significance and simplicity of this methodology as a means of determining levels of fire protection, it should be clearly understood that Q₁ is only that minimum quantity of fire-fighting agent required for 1-minute fire control (90 percent extinguishment) of the anticipated practical critical fire area. Therefore, any fire and rescue service cannot be expected to perform an effective rescue effort where equipped with less than the quantity of primary extinguishing agent specified by the volume of Q₁ for the specific airport/heliport category. Furthermore, a fire suppression/rescue mission that is initiated using the required minimum application rate and is continued at that rate, while effectively extinguishing fire or securing unburned fuel within the practical area, ceases operations at the end of 1 minute. In other words, the agent specified by the volume Q₁ is depleted. There is no agent available for mop-up activities, foam blanket repair, or standby protection for continued rescue or salvage activities. Therefore, while the control volume Q₁ provides an operational significance that is critical to the rescue operation, it is, at the same time, limited.

It should therefore be clear that in order to extend an effective fire suppression and rescue operation beyond the initial 1-minute fire control period, an additional volume of foam agent, Q₂, needs to be available. This volume of agent is used to repair foam blanket damage that might be caused by evacuees and rescue workers walking through the foamed areas or by hot surfaces created by the initial fire. Furthermore, Q₂ is needed to extinguish all fire in the practical critical fire area and those fires outside the practical critical area that initially

are determined to pose no threat to life. Agent quantity in accordance with Q₂ also provides standby protection before total extinguishment during interior aircraft search operations and for the removal of immobile survivors after fire control. It also is used for securing the fire area during initial aircraft salvage operations immediately after total fire extinguishment. Therefore, an aircraft fire service equipped with only the 1-minute fire control volume represented by Q₁ is expected to assume a significant level of risk. That risk cannot be considered a "calculated risk" unless the manager selecting the reduced agent volume knows the nature of the fire area and the potential hazard involved. (418:A-3-6.1)

A-10-3.7.3 The area of application and the duration where using a hose line system is reduced because foam is applied efficiently and directly on the fire by trained personnel. (418:A-3-6.3)

A-13-1.4 See Figures A-1-3.2(a) through (e) in NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, which show examples of clearance reduction systems. (96:A-1-3.2)

A-13-1.5.1 Cleaning to bare metal does not mean to remove the paint from a painted surface of the exhaust system. (96:A-8-3.1)

A-13-2.1 The system used to rate extinguishers for Class B fires (flammable liquids in depth) does not take into consideration the special nature of heated grease fires. Cooking grease fires are a special hazard requiring agents that saponify (make a

soap foam layer to seal the top surface of the grease) for this application. (96:A-7-10.1)

A-13-2.3 Fire extinguishers for cooking media (vegetable or animal oils and fats) traditionally followed Table 7-6.3.3.1 of NFPA 10 for extra (high) hazard, requiring a minimum 40-B rated sodium bicarbonate or potassium bicarbonate dry chemical extinguisher. The evolution of high-efficiency cooking appliances and the change to hotter-burning vegetable shortening has created a more severe fire hazard. Testing has shown that wet chemical extinguishers have several times the cooking fire-extinguishing capability of a minimum 40-B rated sodium bicarbonate or potassium bicarbonate dry chemical extinguisher, which has prompted the creation of a new classification and a new listing test protocol. The listing test protocol is described in NFPA 10, *Standard for Portable Fire Extinguishers*, A-2-3.2(a) through (c). Refer to NFPA 10, *Appendices C, D, and E* for information on Class K and other fire extinguishers used to protect kitchen areas. (10:A-2-3.2)

A-13-3.3.3 UL 300, *Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas*, primarily addresses self-contained chemical extinguishing systems. (96:A-7-2.2)

A-17-2 NFPA 30, *Flammable and Combustible Liquids Code*, contains additional provisions for design and operations of flammable and combustible liquid facilities.

A-17-3.1.1 NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*, does not cover spray application operations that are conducted outdoors on buildings, bridges, tanks, or similar structures. These situations occur only occasionally for any given structure and overspray deposits are not likely to present a hazardous condition. Also, the space where there might be an ignitable vapor-air or dust-air mixture is very limited due to atmospheric dilution. (33:A-1-1.3)

For information on specific applications, see the following chapters of NFPA 33: Chapter 9 on Fixed Electrostatic Apparatus (including robots), Chapter 10 on Electrostatic Hand Spraying Equipment, Chapter 11 on Drying, Curing, or Fusion Processes, Chapter 12 on Automobile Undercoating in Garages, Chapter 13 on Powder Coatings, and Chapter 14 on Organic Peroxides and Plural Component Coatings (including Fiberglass).

A-17-3.4.5 NFPA 77, *Recommended Practice on Static Electricity*, contains information about grounding for static electric charge. (33:A-4-5)

A-17-3.6.4.2 NFPA 77, *Recommended Practice on Static Electricity*, provides information on static protection. (33:6-5.2)

A-17-4.3 See NFPA 86, *Standard for Ovens and Furnaces*.

A-17-4.4 Section 17-4.4 anticipates conditions of average use.

A-17-6 The authority having jurisdiction should review NFPA 329, *Recommended Practice for Handling Releases of Flammable and Combustible Liquids and Gases*, for guidance.

A-18-2.2(3) For additional information on cutting and welding of containers that have held flammable materials, see NFPA 327, *Standard Procedures for Cleaning or Safeguarding Small Tanks and Containers Without Entry*, and ANSI/AWS F-4.1, *Rec-*

ommended Safe Practices for the Preparation for Welding and Cutting Containers and Piping.

Additional consideration should be given when performing hot work in areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulfur, baled paper, or cotton. For additional information on welding and cutting in storage areas, refer to NFPA 231, *Standard for General Storage*, NFPA 231C, *Standard for Rack Storage of Materials*, NFPA 231D, *Standard for Storage of Rubber Tires*, NFPA 231E, *Recommended Practice for the Storage of Baled Cotton*; and NFPA 655, *Standard for Prevention of Sulfur Fires and Explosions*. (51B:A-3-2)

A-18-2.3.2 Examples of hot work permits are shown in Figures A-18-2.3.2(a) and A-18-2.3.2(b). These permits can be modified to suit local conditions. (51B:A-3-3.1)

A-18-2.3.3(3) When hot work is performed at an elevated level, it should be noted that the sparks or slag can fall at a trajectory and land further than 35 ft (11 m) horizontally from a point directly under the hot work operator. [51B: A-3-3.2(c)]

A-18-2.3.4 It is advisable that the permit should be issued for a maximum period of 24 hours. (51B:A-3-3.3)

A-18-2.3.5 In some situations, it is advisable to inspect the area once per shift if conditions warrant. (51B:A-3-3.4)

A-18-2.4.1(1) Figure A-3-4.1(1) demonstrates the hot work 35-ft (11-m) rule. [51B:A-3-4.1(a)]

A-18-2.4.3 Situations where an additional fire watch(es) might be necessary include hot work near open shafts, elevated heights, or where sparks can travel through openings, and so on. (51B: A-3-4.3)

A-18-2.4.7 It is desirable for the fire watch to have experience with test fires. (51B:A-2-4.4)

A-18-3.2.3 For information on marking and labeling of compressed and liquefied gas cylinders, see CGA C-7, *Guide to the Precautionary Labeling and Marking of Compressed Gas Containers*. (51:A-2-1.3)

A-20-1.1 NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*, contains requirements, but not all-inclusive requirements, for handling and storage of chemicals, where laboratory-scale operations are conducted. It does not cover the special fire protection required when handling explosive materials or the special fire protection required when handling radioactive materials.

A-20-1.3(6) For information on working with radioactive materials, see NFPA 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials*.

A-21-2.1.2 Prior to April 1, 1967, regulations of the U.S. Department of Transportation were promulgated by the Interstate Commerce Commission. In Canada, the regulations of the Canadian Transport Commission apply. Available from the Canadian Transport Commission, Union Station, Ottawa, Canada.

Construction of containers to the API-ASME Code, has not been authorized after July 1, 1961. (58:A-2-2.1.3)

FIGURE A-18-2.3.2(a) Sample of a hot work permit. [51B:Figure A-3-3.1(a)]

| Side 1 PERMIT FOR CUTTING AND WELDING WITH PORTABLE GAS OR ARC EQUIPMENT | Side 2 ATTENTION |
|--|---|
| Date _____ Building _____ Dept. _____ Floor _____ Work to be done _____ _____ Special precautions _____ _____ Is fire watch required? _____ The location where this work is to be done has been examined, necessary precautions taken, and permission is granted for this work. (See other side.) Permit expires _____ <div style="text-align: right;">Signed _____</div> <div style="text-align: center; font-size: small;">(Individual responsible for authorizing welding and cutting)</div> Time Started _____ Completed _____ <div style="text-align: center;">FINAL CHECK</div> Work area and all adjacent areas to which sparks and heat might have spread (including floors above and below and on opposite side of wall(s) were inspected 30 minutes after the work was completed and were found firesafe. <div style="text-align: right;">Signed _____</div> <div style="text-align: center; font-size: small;">(Supervisor of Fire Watcher)</div> | Before approving any cutting and welding permit, the fire safety supervisor or appointee shall inspect the work area and confirm that precautions have been taken to prevent fire in accordance with NFPA 51B. <div style="text-align: center;">PRECAUTIONS</div> <div style="list-style-type: none; padding-left: 0;"> <input type="checkbox"/> Sprinklers in service <input type="checkbox"/> Cutting and welding equipment in good repair </div> <div style="text-align: center; font-size: small;">WITHIN 35 FT OF WORK</div> <div style="list-style-type: none; padding-left: 0;"> <input type="checkbox"/> Floors swept clean of combustibles <input type="checkbox"/> Combustible floors wet down, covered with damp sand, metal, or other shields. <input type="checkbox"/> All wall and floor openings covered <input type="checkbox"/> Covers suspended beneath work to collect sparks </div> <div style="text-align: center; font-size: small;">WORK ON WALLS OR CEILINGS</div> <div style="list-style-type: none; padding-left: 0;"> <input type="checkbox"/> Construction noncombustible and without combustible covering <input type="checkbox"/> Combustibles moved away from opposite side of wall </div> <div style="text-align: center; font-size: small;">WORK ON ENCLOSED EQUIPMENT (Tanks containers, ducts, dust collectors, etc.)</div> <div style="list-style-type: none; padding-left: 0;"> <input type="checkbox"/> Equipment cleaned of all combustibles <input type="checkbox"/> Containers purged of flammable vapors </div> <div style="text-align: center; font-size: small;">FIRE WATCH</div> <div style="list-style-type: none; padding-left: 0;"> <input type="checkbox"/> To be provided during and 30 minutes after operation <input type="checkbox"/> Supplied with extinguisher and small hose <input type="checkbox"/> Trained in use of equipment and in sounding fire alarm </div> <div style="text-align: center; font-size: small;">FINAL CHECK</div> <div style="list-style-type: none; padding-left: 0;"> <input type="checkbox"/> To be made 30 minutes after completion of any operation unless fire watch is provided. </div> <div style="text-align: right;">Signed _____</div> <div style="text-align: center; font-size: small;">(Supervisor)</div> |

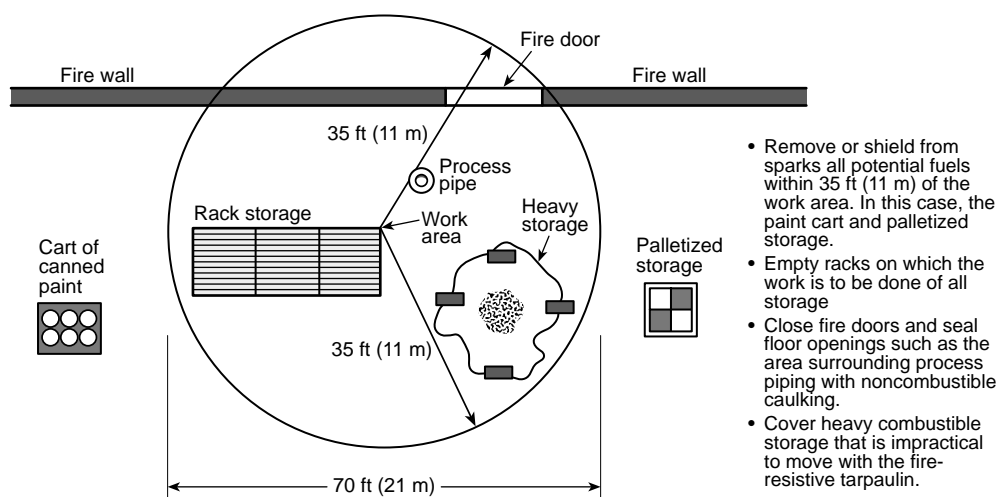
FIGURE A-18-2.3.2(b) Sample of a hot work permit. [51B:Figure A-3-3.1(b)]

HOT WORK PERMIT

BEFORE INITIATING HOT WORK, ENSURE PRECAUTIONS ARE IN PLACE!
MAKE SURE AN APPROPRIATE FIRE EXTINGUISHER IS READILY AVAILABLE!

This Hot Work Permit is required for any operation involving open flames or producing heat and/or sparks. This includes, but is not limited to: Brazing, Cutting, Grinding, Soldering, Thawing Pipe, Torch Applied Roofing, and Cadwelding.

| INSTRUCTIONS | | PART 1 | |
|--|---------|---|----------|
| A. Verify precautions listed at right (or do not proceed with the work). B. Complete and retain PART 1. C. Issue PART 2 to person doing job. | | Required Precautions Checklist | |
| HOT WORK BEING DONE BY <input type="checkbox"/> EMPLOYEE <input type="checkbox"/> CONTRACTOR _____ | | <input type="checkbox"/> Available sprinklers, hose streams and extinguishers are in service/operable. <input type="checkbox"/> Hot Work equipment in good repair. | |
| DATE | JOB NO. | Requirements within 35 ft (10 m) of work | |
| LOCATION/BUILDING & FLOOR | | <input type="checkbox"/> Flammable liquids, dust, lint and oil deposits removed. <input type="checkbox"/> Explosive atmosphere in area eliminated. <input type="checkbox"/> Floors swept clean. <input type="checkbox"/> Combustible floors wet down, covered with damp sand or fire-resistant sheets. <input type="checkbox"/> Remove other combustibles where possible. Otherwise protect with fire-resistant tarpaulins or metal shields. <input type="checkbox"/> All wall and floor openings covered. <input type="checkbox"/> Fire-resistant tarpaulins suspended beneath work. | |
| NATURE OF JOB/OBJECT | | Work on walls or ceilings/enclosed equipment | |
| NAME OF PERSON DOING HOT WORK | | <input type="checkbox"/> Construction is noncombustible and without combustible covering or insulation. <input type="checkbox"/> Combustibles on other side of walls moved away. <input type="checkbox"/> Danger exist by conduction of heat into another area. <input type="checkbox"/> Enclosed equipment cleaned of all combustibles. <input type="checkbox"/> Containers purged of flammable liquids/vapors. | |
| I verify the above location has been examined, the precautions checked on the Required Precautions Checklist have been taken to prevent fire, and permission is authorized for work. | | Fire watch/Hot Work area monitoring | |
| SIGNED: | | <input type="checkbox"/> Fire watch will be provided during and for (30 minutes) after work, including any coffee or lunch breaks. <input type="checkbox"/> Fire watch is supplied with suitable extinguishers. <input type="checkbox"/> Fire watch is trained in use of this equipment and in sounding alarm. <input type="checkbox"/> Fire watch may be required for adjoining areas, above, and below. <input type="checkbox"/> Monitor Hot Work area for 30 minutes after job is completed. | |
| PERMIT EXPIRES: | DATE | TIME | AM PM |
| NOTE EMERGENCY NOTIFICATION ON BACK OF FORM. USE AS APPROPRIATE FOR YOUR FACILITY. | | | |
| THIS PERMIT IS GOOD FOR ONE DAY ONLY! | | | |

FIGURE A-18-2.4.1(1) The hot work 35-ft (11-m) rule. [51B:Figure A-3-4.1(a)]

A-21-3.1.1.6(3) For information on determination of flash points, see NFPA 30, *Flammable and Combustible Liquids Code*. [58:3-2.2.7(c) Note]

A-21-3.1.1.6(6) Also, see NFPA 50, *Standard for Bulk Oxygen Systems at Consumer Sites*, and NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes*, for oxygen systems and NFPA 50A, *Standard for Gaseous Hydrogen Systems at Consumer Sites*, for gaseous hydrogen systems. [58: 3-2.2.7(f) Note]

A-21-3.1.1.7 The presence of such structures can create significant hazards, e.g., pocketing of escaping gas, interference with application of cooling water by fire departments, redirection of flames against containers, and impeding egress of personnel in an emergency. (58: 3-2.2.9 Note)

A-21-3.1.2(6) Generally, a light reflecting color paint is preferred unless the system is installed in an extremely cold climate. [58:A-3-2.4.1(f)]

A-21-3.3.7.3 The weight will be affected by the specific gravity of the liquefied petroleum (LP) gas. Weights varying from 16.0 oz (454 g) to 16.8 oz (476 g) are recognized as being within the range of what is nominal. (58:A-3-4.8.3)

A-21-3.4.1.2 The National Fire Protection Association, American Petroleum Institute, and National Propane Gas Association publish material, including visual aids, useful in such planning. (58:A-3-10.2.2)

A-21-3.4.1.3 In recent years the concept of total product control systems has been developed. Facilities that have redundant automatic product controls systems provide a high level of confidence that propane will not be released during an emergency. Therefore, not only will the storage be protected from a fire that could lead to container rupture, but major fires at the facility would be prevented. The public would be protected, fire fighting operations would be safer, and applications of large quantities of water would not be needed to prevent tank failure.

A fire safety analysis should include the following:

(a) An analysis of local conditions of hazard within the container site

(b) Exposure to or from other properties, population density, and congestion within the site

(c) The probable effectiveness of plant fire brigades or local fire departments based on adequate water supply, response time, and training

(d) Consideration for the adequate application of water by hose stream or other method for effective control of leakage, fire, or other exposures (58: A-3-10.2.3)

A-21-3.4.1.3 Exception No. 2. Special protection is a means of limiting the temperature of an LP-Gas container for purposes of minimizing the possibility of failure of the container as the result of fire exposure. Special protection consists of applied insulating coatings, mounding, burial, water spray fixed systems, or fixed monitor nozzles that meet the criteria specified in 21-4.4.2 or any means listed for this purpose. (58: A-3-10.2.3 Exception 2)

A-21-3.4.2.1 For LP-Gas fixed storage facilities of 60,000-gal (227-m³) water capacity or less, a competent fire safety analysis (see 21-3.4.1.3) could indicate that applied insulating coatings are quite often the most practical solution for special protection.

It is recommended that insulation systems be evaluated on the basis of experience or listings by an approved testing laboratory. (58: A-3-10.3.1)

A-21-5.5.1 The filling process in (e) refers to the time period beginning when a cylinder or cylinders are brought to a dispensing station to be filled and ending when the last cylinder is filled and all the cylinders are removed from the filling area. This is meant to define a continuous process with the cylinders being unattended for only brief periods, such as operator breaks or lunch. (58: A-5-4.1)

A-22-1.1 NFPA 303, *Fire Protection Standard for Marinas and Boatyards*, recognizes the following circumstances:

(1) Electrical wiring on and about piers and floats and connected to craft presents exceptional fire and shock hazard. NFPA 303, *Fire Protection Standard for Marinas and Boatyards*, emphasizes, and in some cases exceeds, the requirements of NFPA 70, *National Electrical Code*.

- (2) Marinas and related facilities frequently are located in remote areas, isolated from public protection, or with dock areas that are not easily accessible to community fire equipment. Hence, the selection, location, and maintenance of fire-fighting equipment, and adequate training in its use, are essential.
- (3) Continuing operations such as fiberglassing, woodworking, painting and paint removing, welding and cutting, and handling gasoline and other highly flammable liquids are hazardous operations that require careful vigilance and fire prevention effort by management.

A-22-2.3(1) See NFPA 303, *Fire Protection Standard for Marinas and Boatyards*. (307:A-1-1.2)

A-22-2.3(2) See NFPA 30, *Flammable and Combustible Liquids Code*. (307:A-1-1.3)

A-22-2.3(3) See NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*, or NFPA 58, *Liquefied Petroleum Gas Code*. (307:A-1-1.4)

A-22-3.1 Due to the quantity and character of combustible materials used, many vessels undergoing construction, conversion, or repairs, and vessels laid up in a shipyard or elsewhere are readily vulnerable to fire. Long passageways, unenclosed stairways, hatches, and hoistways facilitate the rapid spread of fire throughout the vessel. The location of the vessel is often so isolated that private protection is the main source of fire-fighting services. Even where major municipal protection is available, the possible delayed response due either to lateness in the discovery of the fire or the absence of means for quick notification, lack of special equipment in many municipal fire departments for combating shipboard fires, or an unfamiliarity with ship construction due to the transitory nature of the risk can cause material damage or complete destruction before effective means of extinguishment can be brought into action. Therefore, every reasonable means of preventing fire shall be provided and supplemented by means of detection and protection equipment that permit the prompt discovery, retard the spread, and permit extinguishment of any fire before it has passed the incipient stage. This includes full coordination and cooperation with municipal fire departments. (312: Introduction)

A-23-4 Emergency discharge systems for ammonia and other refrigerants should comply with the requirements of ASHRAE 15, *Safety Code for Mechanical Refrigeration*.

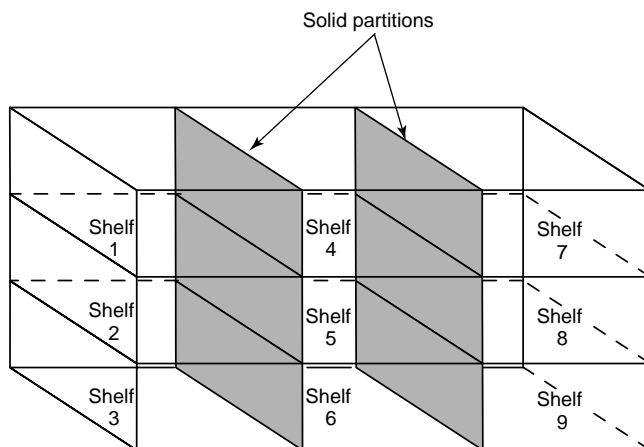
Where discharge to atmosphere endangers life or the environment, manually controlled discharge of refrigerant vapor to a water diffusion system should be considered.

A-24-2.2(3) The term *contamination* in this definition means minor contamination that can occur if the material is spilled or placed into improperly cleaned equipment. It does not mean gross contamination with large quantities of combustibles or incompatible materials. [430:A-1-6(c)]

A-24-2.2(4) See A-24-2.2(3).

A-24-2.5.1.1 Recommended retail store arrangements for mutually incompatible oxidizers are shown in Figures A-24-2.5.1.1(a) and (b). These two diagrams illustrate arrangements that minimize the chance of contamination between incompatible materials. Wherever possible, vertical separation should be maintained between incompatible materials. (430:A-7-2.1)

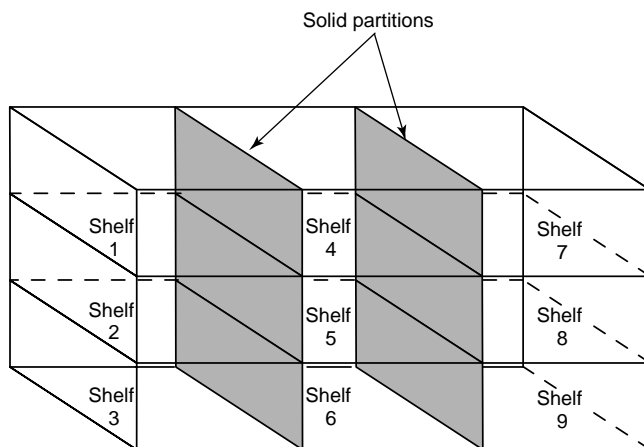
FIGURE A-24-2.5.1.1(a) Recommended retail store arrangement for mutually incompatible oxidizers. [430:Figure A-7-2.1(a)]



| | | |
|---------------------|---------------------|---------------------|
| Shelf 1: Oxidizer A | Shelf 4: Oxidizer B | Shelf 7: Oxidizer C |
| Shelf 2: Oxidizer A | Shelf 5: Oxidizer B | Shelf 8: Oxidizer C |
| Shelf 3: Oxidizer A | Shelf 6: Oxidizer B | Shelf 9: Oxidizer C |

Oxidizers A, B, and C are mutually incompatible.

FIGURE A-24-2.5.1.1(b) Recommended retail store arrangement for mutually incompatible oxidizers and other incompatible materials. [430:Figure A-7-2.1(b)]



| | | |
|---------------------|---------------------|---------------------|
| Shelf 1: Oxidizer A | Shelf 4: Oxidizer B | Shelf 7: Oxidizer C |
| Shelf 2: Oxidizer A | Shelf 5: Oxidizer B | Shelf 8: Oxidizer C |
| Shelf 3: Oxidizer A | Shelf 6: Oxidizer B | Shelf 9: Oxidizer C |

Oxidizers A, B, and C are mutually incompatible.

A-24-2.5.1.5 For certain oxidizers in combustible containers, (e.g., calcium hypochlorite in plastic containers) automatic sprinkler protection is effective only for control of exposure fires. (430:A-7-2.5)

A-24-2.7.3 Only the building limit, not the pile limit, height, or width, can be increased by this provision. (430:A-3-2.3 Note)

A-24-2.8.4 Only the building limit, not the pile limit, height, or width, can be increased by this provision. (430:A-4-2.4 Note)

A-24-2.9.5 Only the building limit, not the pile limit, height, or width, can be increased by this provision. (430:A-5-2.5 Note)

A-24-3.6.1.3 In the venting equation, use the fuel characteristic constant for “gases with fundamental burning velocity less than 1.3 times that of propane.” See NFPA 68, *Guide for Venting of Deflagrations*, for information on vent design. Refer to manufacturers’ technical data for information on organic peroxide formulations that give off flammable gases upon decomposition. (432:A-2-10.1.3)

A-24-3.7.3.3 For information on combustible or limited-combustible construction, see NFPA 220, *Standard on Types of Building Construction*. (432:A-3-4.3)

A-24-3.8.1.4 In the venting equation, use the fuel characteristic constant for “gases with fundamental burning velocity less than 1.3 times that of propane.” See NFPA 68, *Guide for Venting of Deflagrations*, for information on vent design. Refer to manufacturers’ technical data for information on organic peroxide formulations that give off flammable gases upon decomposition. (432:A-4-3.4)

A-24-3.8.2 For information on combustible or limited-combustible construction, see NFPA 220, *Standard on Types of Building Construction*. (432:A-4-4)

A-26-1.1 Additional examples of agricultural pesticides covered by this Code can be found in the *Farm Chemicals Handbook*. (434:A-1-1.2)

A-27-1.2 NFPA 501, *Standard on Manufactured Housing*, covers the equipment and installations used in the design, construction, transportation, fire safety, plumbing, heat-producing, and electrical systems of manufactured homes that are designed to be used as dwelling units.

A-27-2.2 NFPA 1192, *Standard on Recreational Vehicles*, is a companion standard to NFPA 1194, *Standard for Recreational Vehicle Parks and Campgrounds*, and covers the fire and life safety criteria for recreational vehicles considered necessary to provide a reasonable level of protection from loss of life due to fire and explosion.

A-28-2.2.1.5 API 1621, *Recommended Practice for Bulk Liquid Stock Control at Retail Outlets*, provides information on this subject. (30A:A-2-1.5)

A-28-2.2.4.1 PEI RP200, *Recommended Practices for Installation of Aboveground Storage Systems for Motor Vehicle Fueling*, provides information on this subject. (30A:A-2-4.1)

A-28-2.8.2.2 There have been many instances of fires at service stations involving customers filling portable gasoline containers in pickup trucks with plastic bed liners. In investigations of these incidents, it appears that static electricity of the bed liner prevents the static charge from dissipating to ground. The static charge in the portable container arcs to the dispensing nozzle causing a spark that ignites the gasoline vapor at the mouth of the container. The following steps can be taken to prevent the danger:

- (1) Use an approved portable container.
- (2) Do not fill any portable container while it is inside a vehicle, a vehicle’s trunk, a pickup truck bed, or any surface other than ground.
- (3) Remove portable containers from the vehicle and place them on the ground to fill.
- (4) Keep the nozzle in contact with the portable container during filling.
- (5) Never use a latch open device to fill a portable container.
- (6) Follow all other safety procedures, including no smoking. (30A:A-9-2.2)

A-28-4.6.2 NFPA 77, *Recommended Practice on Static Electricity*, contains information on bonding and grounding. (30A:A-10-7.2)

A-28-5.2 For information on on-site storage of LNG in ASME tanks larger than 70,000 gal (265 m³) and tanks built to API or other standards, see NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*.

At the time NFPA 57, *Liquefied Natural Gas (LNG) Vehicular Fuel Systems Code*, was developed, the use of LNG as an aviation fuel, fueling site liquefaction facilities, and the use of residential LNG fueling facilities were not being considered actively. The Technical Committee on Natural Gas Vehicular Fuel Systems intends to provide coverage for these applications at the appropriate time.

A-29-1.3 See also NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*. (101:A.4.6.10.2)

Appendix B Oxidizers and Organic Peroxides

This appendix is not a part of the requirements of this NFPA document but is included for informational purposes only.

B-1 This appendix provides information, explanations, and examples to illustrate and clarify the hazard categories contained in Chapter 24 of this Code. The hazard categories are based on 29 *CFR*. Where numerical classifications are included, they are in accordance with nationally recognized standards.

B-2 Oxidizers.

B-2.1 General. The oxidizers on the following lists are typical for their class. Each oxidizer is undiluted unless a concentration is specified.

B-2.2 Typical Class 1 Oxidizers.

All inorganic nitrates (unless otherwise classified)
 All inorganic nitrites (unless otherwise classified)
 Ammonium persulfate
 Barium peroxide
 Calcium peroxide
 Hydrogen peroxide solutions (greater than 8 percent up to 27.5 percent)
 Lead dioxide
 Lithium hypochlorite (39 percent or less available chlorine)
 Lithium peroxide
 Magnesium peroxide
 Manganese dioxide
 Nitric acid (40 percent concentration or less)
 Perchloric acid solutions (less than 50 percent by weight)
 Potassium dichromate
 Potassium percarbonate
 Potassium persulfate
 Sodium carbonate peroxide
 Sodium dichloro-s-triazinetriene dihydrate
 Sodium dichromate
 Sodium perborate (anhydrous)
 Sodium perborate monohydrate
 Sodium perborate tetrahydrate
 Sodium percarbonate
 Sodium persulfate
 Strontium peroxide
 Trichloro-s-triazinetriene (trichloroisocyanuric acid) all forms)
 Zinc peroxide

B-2.3 Typical Class 2 Oxidizers.

Barium bromate
 Barium chlorate
 Barium hypochlorite
 Barium perchlorate
 Barium permanganate
 1-Bromo-3-chloro-5,5-dimethylhydantoin (BCDMH)
 Calcium chlorate

Calcium chlorite
 Calcium hypochlorite (50 percent or less by weight)
 Calcium perchlorate
 Calcium permanganate
 Chromium trioxide (Chromic acid)
 Copper chlorate
 Halane (1,3-dichloro-5,5-dimethylhydantoin)
 Hydrogen peroxide (greater than 27.5 percent up to 52 percent)
 Lead perchlorate
 Lithium chlorate
 Lithium hypochlorite (more than 39 percent available chlorine)
 Lithium perchlorate
 Magnesium bromate
 Magnesium chlorate
 Magnesium perchlorate
 Mercurous chlorate
 Nitric acid (more than 40 percent but less than 86 percent)
 Nitrogen tetroxide
 Perchloric acid solutions (more than 50 percent but less than 60 percent)
 Potassium perchlorate
 Potassium permanganate
 Potassium peroxide
 Potassium superoxide
 Silver peroxide
 Sodium chlorite (40 percent or less by weight)
 Sodium perchlorate
 Sodium perchlorate monohydrate
 Sodium permanganate
 Sodium peroxide
 Strontium chlorate
 Strontium perchlorate
 Thallium chlorate
 Urea hydrogen peroxide
 Zinc bromate
 Zinc chlorate
 Zinc permanganate

B-2.4 Typical Class 3 Oxidizers.

Ammonium dichromate
 Calcium hypochlorite (over 50 percent by weight)
 Chloric acid (10 percent maximum concentration)
 Hydrogen peroxide solutions (greater than 52 percent up to 91 percent)
 Mono-(trichloro)-tetra-(monopotassium dichloro)-penta-s-triazinetriene
 Nitric acid, fuming (more than 86 percent concentration)
 Perchloric acid solutions (60 percent to 72 percent by weight)
 Potassium bromate

Potassium chlorate
 Potassium dichloro-s-triazinetriene (Potassium dichloroisocyanurate)
 Sodium bromate
 Sodium chlorate
 Sodium chlorite (over 40 percent by weight)
 Sodium dichloro-s-triazinetriene (sodium dichloroisocyanurate)

B-2.5 Typical Class 4 Oxidizers.

Ammonium perchlorate (particle size greater than 15 microns)
 Ammonium permanganate
 Guanidine nitrate

Hydrogen peroxide solutions (greater than 91 percent)
 Tetranitromethane

NOTE: Ammonium perchlorate less than 15 microns is classified as an explosive and, as such, is not covered by this Code. (See NFPA 495, *Explosive Materials Code*.) (430:Appendix B)

B-3 Organic Peroxide Formulations.

B-3.1 General.

B-3.1.1 The assignment of the organic peroxide formulation classifications shown in Tables B-3.1.2, B-3.2.3, B-3.3.3, B-3.4.3, B-3.5.3, and B-3.6.3 in this Appendix are based on the container sizes shown. A change in the container size could affect the classification.

B-3.1.2 Table B-3.1.2 is an alphabetical listing of typical organic peroxide formulations.

Table B-3.1.2 Class Index of Organic Peroxide Formulations

| Organic Peroxide Formulation | Concentration | Diluent | Container | Class |
|--|---------------|----------------|-------------------------|-------|
| t-Amyl Hydroperoxide | 88 | Water | 55 gal (208 L) | III |
| t-Amyl Peroxyacetate | 60 | OMS | 5 gal (19 L) | III |
| t-Amyl Peroxybenzoate | 96 | — | 5 gal (19 L) | II |
| t-Amyl Peroxy-2-ethylhexanoate | 96 | — | 55 gal (208 L) | III |
| t-Amyl Peroxyneodecanoate | 75 | OMS | 5 gal (19 L) | III |
| t-Amyl Peroxypivalate | 75 | OMS | 5 gal (19 L) | III |
| t-Butyl Cumyl Peroxide | 95 | — | 55 gal (208 L) | IV |
| n-Butyl 4,4-Di(t-butylperoxy) Valerate | 98 | — | 5 gal (19 L) | II |
| t-Butyl Hydroperoxide | 90 | Water & t-BuOH | 5 gal (19 L) | I |
| t-Butyl Hydroperoxide | 70 | DTBP & t-BuOH | 55 gal (208 L) | II |
| t-Butyl Hydroperoxide | 70 | Water | 55 gal (208 L) | IV |
| t-Butyl Peroxyacetate | 75 | OMS | 5 gal (19 L) | I |
| t-Butyl Peroxyacetate | 60 | OMS | 5 gal (19 L) | I |
| t-Butyl Peroxybenzoate | 98 | — | 5 gal (19 L) | II |
| t-Butyl Peroxy-2-ethylhexanoate | 97 | — | 5 gal (19 L) | III |
| t-Butyl Peroxy-2-ethylhexanoate | 97 | — | 55 gal (208 L) | II |
| t-Butyl Peroxy-2-ethylhexanoate | 50 | DOP or OMS | 5 gal (19 L) | IV |
| t-Butyl Peroxy-2-ethylhexanoate | 50 | DOP or OMS | 55 gal (208 L) | III |
| t-Butylperoxy 2-Ethylhexyl Carbonate | 95 | — | 5 gal (19 L) | III |
| t-Butyl Peroxyisobutyrate | 75 | OMS | 5 gal (19 L) | II |
| t-Butylperoxy Isopropyl Carbonate | 92 | OMS | 5 gal (19 L) | I |
| t-Butylperoxy Isopropyl Carbonate | 75 | OMS | 5 gal (19 L) | II |
| t-Butyl Peroxymaleate | 98 | — | 50 × 1 lb (50 × 0.5 kg) | I |
| t-Butyl Peroxyneodecanoate | 75 | OMS | 5 gal (19 L) | III |
| t-Butyl Peroxypivalate | 75 | OMS | 5 gal (19 L) | II |
| t-Butyl Peroxypivalate | 45 | OMS | 5 gal (19 L) | IV |
| Cumyl Hydroperoxide | 88 | Cumene | 55 gal (208 L) | III |
| Cumyl Peroxyneodecanoate | 75 | OMS | 5 gal (19 L) | III |
| Cumyl Peroxyneoheptanoate | 75 | OMS | 5 gal (19 L) | III |
| Diacetyl Peroxide | 25 | DMP | 5 gal (19 L) | II |
| 1,1-Di(t-amylperoxy) Cyclohexane | 80 | OMS or BBP | 5 gal (19 L) | III |
| Dibenzoyl Peroxide | 98 | — | 1 lb (0.5 kg) | I |
| Dibenzoyl Peroxide | 78 | Water | 25 lb (11 kg) | II |
| Dibenzoyl Peroxide | 75 | Water | 25 lb (11 kg) | III |
| Dibenzoyl Peroxide | 70 | Water | 25 lb (11 kg) | IV |

(Sheet 1 of 2)

Table B-3.1.2 Class Index of Organic Peroxide Formulations (Continued)

| Organic Peroxide Formulation | Concentration | Diluent | Container | Class |
|---|---------------|--|-----------------------|-------|
| Dibenzoyl Peroxide paste | 55 | Plasticizer | 350 lb (160 kg) | III |
| Dibenzoyl Peroxide paste | 55 | Plasticizer & Water | 350 lb (160 kg) | IV |
| Dibenzoyl Peroxide paste | 50 | Plasticizer | 380 lb (170 kg) | III |
| Dibenzoyl Peroxide paste | 50 | Plasticizer & Water | 380 lb (170 kg) | IV |
| Dibenzoyl Peroxide slurry | 40 | Water & Plasticizer | 380 lb (170 kg) | IV |
| Dibenzoyl Peroxide slurry | 40 | Water | 5 gal (19 L) | IV |
| Dibenzoyl Peroxide powder | 35 | Dicalcium Phosphate Dihydrate or Calcium Sulfate Dihydrate | 100 lb (45 kg) | V |
| Dibenzoyl Peroxide powder | 35 | Starch | 100 lb (45 kg) | IV |
| Di (4-t-butylcyclohexyl) Peroxydicarbonate | 98 | — | 88 lb (40 kg) | III |
| Di-t-butyl Peroxide | 99 | — | 55 gal (208 L) | III |
| 2,2-Di(t-butylperoxy)Butane | 50 | Toluene | 1 gal (4 L) | I |
| 1,1-Di(t-butylperoxy)Cyclohexane | 80 | OMS or BBP | 5 gal (19 L) | II |
| Di-sec-butyl Peroxydicarbonate | 98 | — | 1 gal (4 L) | II |
| Di-sec-butyl Peroxydicarbonate | 75 | OMS | 5 gal (19 L) | II |
| Di(2-t-butylperoxyisopropyl)Benzene | 96 | — | 100 lb (45 kg) | III |
| Di(2-t-butylperoxyisopropyl)Benzene | 40 | Clay | 100 lb (45 kg) | V |
| Di(butylperoxy) Phthalate | 40 | DBP | 30 gal (110 L) | IV |
| 1,1-Di-(t-butylperoxy)-3,3,5-trimethylcyclohexane | 75/95 | — | 5 gal (19 L) | II |
| 1,1-Di-(t-butylperoxy)-3,3,5-trimethylcyclohexane | 40 | Calcium Carbonate | 100 lb (45 kg) | V |
| Dicetyl Peroxydicarbonate | 85 | — | 20 kg (44 lb) | IV |
| 2,4-Dichlorobenzoyl Peroxide | 50 | DBP & Silicone | 5 gal (19 L) | III |
| Dicumyl Peroxide | 98 | — | 55 gal (208 L) | IV |
| Dicumyl Peroxide | 40 | Clay or Calcium Carbonate | 100 lb (45kg) | V |
| Didecanoyl Peroxide | 98 | — | 50 lb (23 kg) | III |
| Di(2-ethylhexyl) Peroxydicarbonate | 97 | — | 1 gal (4 L) | II |
| Di(2-ethylhexyl) Peroxydicarbonate | 40 | OMS | 5 gal (19 L) | IV |
| Diisopropyl Peroxydicarbonate | 99 | — | 10 lb (4.5 kg) | I |
| Diisopropyl Peroxydicarbonate | 30 | Toluene | 5 lb (2.3 kg) | III |
| Di-n-propyl Peroxydicarbonate | 98 | — | 1 gal (4 L) | I |
| Di-n-propyl Peroxydicarbonate | 85 | OMS | 1 gal (4 L) | I |
| Dilauroyl Peroxide | 98 | — | 110 lb (50 kg) | IV |
| 2,5-Dimethyl-2,5-di(benzoylperoxy)Hexane | 95 | — | 4 × 5 lb (4 × 2.3 kg) | II |
| 2,5-Dimethyl-2,5-di(t-butylperoxy)Hexane | 92 | — | 30 gal (110 L) | III |
| 2,5-Dimethyl-2,5-di(t-butylperoxy)Hexane | 47 | Calcium Carbonate or Silica | 100 lb (45 kg) | V |
| 2,5-Dimethyl-2,5-di(2-ethylhexanoylperoxy) Hexane | 90 | — | 5 gal (19 L) | III |
| 2,5-Dimethyl-2,5-dihydroperoxyhexane | 70 | Water | 100 lb (45 kg) | II |
| Ethyl 3,3-Di(t-amylperoxy)Butyrate | 75 | OMS | 5 gal (19 L) | III |
| Ethyl 3,3-Di(t-amylperoxy)Butyrate | 40 | Clay or Calcium Silicate | 100 lb (45 kg) | V |
| p-Menthyl Hydroperoxide | 54 | Alcohols & Ketones | 55 gal (208 L) | IV |
| Methyl Ethyl Ketone Peroxide | 9% AO | DMP | 5 gal (19 L) | III |
| Methyl Ethyl Ketone Peroxide | 5.5% AO | DMP | 5 gal (19 L) | IV |
| Methyl Ethyl Ketone Peroxide | 9% AO | Water & Glycols | 5 gal (19 L) | IV |
| Methyl Ethyl Ketone Peroxide and Cyclohexanone Peroxide mixture | 9% AO | DMP | 5 gal (19 L) | III |
| 2,4-Pentanedione Peroxide | 4% AO | Water & Solvent | 5 gal (19 L) | IV |
| Peroxyacetic Acid | 43 | Water, HOAc, & H ₂ O ₂ | 30 gal (110 L) | II |

(Sheet 2 of 2)

Note: Diluents: OMS — odorless mineral spirits; t-Bu-OH — Tertiary Butanol; DTBP — Di-tertiary-butylperoxide; DOP — Dioctyl Phthalate; BBP — Butyl Benzyl Phthalate; DBP — Dibutyl Phthalate; DMP — Dimethyl Phthalate; HOAc — Acetic Acid; H₂O₂ — Hydrogen Peroxide. (432:Table B-1)

B-3.2 Class I Formulations.

B-3.2.1 Fire Hazard Characteristics. Class I formulations present a deflagration hazard through easily initiated, rapid explosive decomposition. Class I includes some formulations that are relatively safe only under closely controlled temperatures. Either excessively high or low temperatures can increase the potential for severe explosive decomposition. (432:B-2.1)

B-3.2.2 Fire-Fighting Information. The immediate area should be evacuated and the fire should be fought from a remote location. Some damage to structures from overpressure can be expected should a deflagration occur. (432:B-2.2)

B-3.2.3 Typical Class I Formulations. See Table B-3.2.3.

B-3.3 Class II Formulations.

B-3.3.1 Fire Hazard Characteristics. Class II formulations present a severe fire hazard similar to Class I flammable liquids. The decomposition is not as rapid, violent, or complete as that produced by Class I formulations. As with Class I formulations, this class includes some formulations that are relatively safe when under controlled temperatures or when diluted. (432:B-3.1)

B-3.3.2 Fire-Fighting Information. Fires should be fought from a safe distance, because a hazard exists from rupturing containers. (432:B-3.2)

B-3.3.3 Typical Class II Formulations. See Table B-3.3.3.

B-3.4 Class III Formulations.

B-3.4.1 Fire Hazard Characteristics. Class III formulations present a fire hazard similar to Class II combustible liquids. They are characterized by rapid burning and high heat liberation, due to decomposition. (432:B-4.1)

B-3.4.2 Fire-Fighting Information. Caution should be observed due to possible unexpected increases in fire intensity. (432:B-4.2)

B-3.4.3 Typical Class III Formulations. See Table B-3.4.3.

B-3.5 Class IV Formulations.

B-3.5.1 Fire Hazard Characteristics. Class IV formulations present fire hazards that are easily controlled. Reactivity has little effect on fire intensity. (432:B-5.1)

B-3.5.2 Fire-Fighting Information. Normal fire-fighting procedures can be used. (432:B-5.2)

B-3.5.3 Typical Class IV Formulations. See Table B-3.5.3.

B-3.6 Class V Formulations.

B-3.6.1 Fire Hazard Characteristics. Class V formulations do not present severe fire hazards. Those that do burn, do so with less intensity than ordinary combustibles. (432:B-6.1)

B-3.6.2 Fire-Fighting Information. Fire-fighting procedures need primarily consider the combustibility of containers. (432:B-6.2)

B-3.6.3 Typical Class V Formulations. See Table B-3.6.3.

Table B-3.2.3 Typical Class I Formulations

| Organic Peroxide Formulation | Nominal Concentration, Weight Percent | Diluent | Individual Container Size | Temp. Control | Hazard Identification ¹ | | |
|-----------------------------------|---------------------------------------|----------------|----------------------------|---------------|------------------------------------|--------|------------|
| | | | | | Health | Flamm. | Reactivity |
| t-Butyl Hydroperoxide | 90 | Water & t-BuOH | 5 gal (19 L) | | 3 | 3 | 3 |
| t-Butyl Peroxyacetate | 75 | OMS | 5 gal (19 L) | | 1 | 3 | 3 |
| t-Butyl Peroxyacetate | 60 | OMS | 5 gal (19 L) | | 1 | 3 | 3 |
| t-Butylperoxy Isopropyl Carbonate | 92 | OMS | 5 gal (19 L) | | 1 | 3 | 3 |
| t-Butyl Peroxymaleate | 98 | — | 50 × 1 lb (50 × 0.5 kg) | | 2 | 3 | 3 |
| Dibenzoyl Peroxide | 98 | — | 1 lb (0.5 kg) | | 1 | 3 | 4 |
| 2,2-Di(t-butylperoxy)Butane | 50 | Toluene | 1 gal (4 L) | | 1 | 3 | 3 |
| Diisopropyl Peroxydicarbonate | 99 | — | 10 lb (4.5 kg) | R | 2 | 3 | 4 |
| Di-n-propyl Peroxydicarbonate | 98 | — | 1 gal (4 L) | R | 2 | 3 | 4 |
| Di-n-propyl Peroxydicarbonate | 85 | OMS | 1gal (4 L) | R | 2 | 3 | 3 |

R — Refrigeration required to reduce fire hazard; OMS — Odorless mineral spirits; t-BuOH — tertiary-Butanol.

¹The column refers to NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*, hazard ratings for health, flammability, and reactivity. See NFPA 704 for details.

(432:Table B-2.3)

Table B-3.3.3 Typical Class II Formulations

| Organic Peroxide Formulation | Nominal Concentration, Weight Percent | Diluent | Individual Container Size | Temp. Control | Hazard Identification ¹ | | |
|--|---------------------------------------|--|---------------------------|---------------|------------------------------------|--------|------------|
| | | | | | Health | Flamm. | Reactivity |
| t-Amyl Peroxybenzoate | 96 | — | 5 gal (19 L) | | 2 | 3 | 2 |
| n-Butyl 4,4-Di(t-butylperoxy)Valerate | 98 | — | 5 gal (19 L) | | 2 | 3 | 2 |
| t-Butyl Hydroperoxide | 70 | DTBP & t-BuOH | 55 gal (208 L) | | 3 | 3 | 3 |
| t-Butyl Peroxybenzoate | 98 | — | 5 gal (19 L) | | 1 | 3 | 3 |
| t-Butyl Peroxy-2-ethylhexanoate | 97 | — | 55 gal (208 L) | R | 1 | 3 | 3 |
| t-Butyl Peroxyisobutyrate | 75 | OMS | 5 gal (19 L) | R | 2 | 3 | 3 |
| t-Butylperoxy Isopropyl Carbonate | 75 | OMS | 5 gal (19 L) | | 1 | 3 | 3 |
| t-Butyl Peroxypivalate | 75 | OMS | 5 gal (19 L) | R | 2 | 3 | 3 |
| Diacetyl Peroxide | 25 | DMP | 5 gal (19 L) | T | 2 | 3 | 3 |
| Dibenzoyl Peroxide | 78 | Water | 25 lb (11 kg) | | 1 | 2 | 3 |
| 1,1-Di(t-butylperoxy) Cyclohexane | 80 | OMS or BBP | 5 gal (19 L) | | 1 | 3 | 3 |
| Di-sec-butyl Peroxydicarbonate | 98 | — | 1 gal (4 L) | R | 1 | 3 | 3 |
| Di-sec-butyl Peroxydicarbonate | 75 | OMS | 5 gal (19 L) | R | 1 | 3 | 3 |
| 1,1-Di(t-butylperoxy)-3,3,5-trimethylcyclohexane | 75/95 | — | 5 gal (19 L) | | 2 | 3 | 3 |
| Di(2-ethylhexyl) Peroxydicarbonate | 97 | — | 1 gal (4 L) | R | 1 | 3 | 3 |
| 2,5-Dimethyl-2,5-di-(benzoylperoxy) Hexane | 95 | — | 45 lb (42.3 kg) | | 2 | 3 | 3 |
| 2,5-Dimethyl-2,5-dihydroperoxyhexane | 70 | Water | 100 lb (45 kg) | | 2 | 3 | 3 |
| Peroxyacetic Acid | 43 | Water HOAc & H ₂ O ₂ | 30 gal (110 L) | | 3 | 2 | 3 |

R — Refrigeration required to reduce fire hazard.

T — Temperature control should be considered to reduce fire hazard depending on packaging size and recommendations in manufacturers' literature.

BBP — Butyl Benzyl Phthalate

DMP — Dimethyl Phthalate

DTBP — Di-tertiary-butyl Peroxide

HOAc — Acetic Acid

H₂O₂ — Hydrogen Peroxide

OMS — Odorless Mineral Spirits

t-BuOH — tertiary-Butanol

¹The column refers to NFPA 704, *Standard System for the Identification of Hazards of Materials for Emergency Response*, hazard ratings for health, flammability, and reactivity. See NFPA 704 for details.

(432:Table B-3.3)

Table B-3.4.3 Typical Class III Formulations

| Organic Peroxide Formulation | Nominal Concentration, Weight Percent | Diluent | Individual Container Size | Temp. Control | Hazard Identification ¹ | | |
|---|---------------------------------------|----------------|---------------------------|---------------|------------------------------------|--------|------------|
| | | | | | Health | Flamm. | Reactivity |
| t-Amyl Hydroperoxide | 88 | Water | 55 gal (208 L) | | 3 | 3 | 2 |
| t-Amyl Peroxyacetate | 60 | OMS | 5 gal (19 L) | | 2 | 3 | 2 |
| t-Amyl Peroxy-2-ethyl Hexanoate | 96 | — | 55 gal (208 L) | R | 0 | 3 | 2 |
| t-Amyl Peroxyneodecanoate | 75 | OMS | 5 gal (19 L) | R | 1 | 3 | 2 |
| t-Amyl Peroxypivalate | 75 | OMS | 5 gal (19 L) | R | 1 | 3 | 2 |
| t-Butyl Peroxy-2-ethylhexanoate | 97 | — | 5 gal (19 L) | R | 1 | 3 | 2 |
| t-Butyl Peroxy-2-ethylhexanoate | 50 | DOP or OMS | 55 gal (208 L) | R | 1 | 2 | 2 |
| t-Butylperoxy 2-Ethylhexyl Carbonate | 95 | — | 5 gal (19 L) | | 1 | 3 | 2 |
| t-Butyl Peroxyneodecanoate | 75 | OMS | 5 gal (19 L) | R | 2 | 3 | 2 |
| Cumyl Hydroperoxide | 88 | Cumene | 55 gal (208 L) | | 3 | 2 | 2 |
| Cumyl Peroxyneodecanoate | 75 | OMS | 5 gal (19 L) | R | 1 | 3 | 2 |
| Cumyl Peroxyneoheptanoate | 75 | OMS | 5 gal (19 L) | R | 2 | 3 | 2 |
| 1,1-Di(t-amylperoxy)cyclohexane | 80 | OMS or BBP | 5 gal (19 L) | | 2 | 3 | 2 |
| Dibenzoyl Peroxide | 75 | Water | 25 lb (11 kg) | | 1 | 2 | 2 |
| Dibenzoyl Peroxide paste | 55 | Plasticizer | 350 lb (160 kg) | T | 1 | 2 | 2 |
| Dibenzoyl Peroxide paste | 50 | Plasticizer | 380 lb (170 kg) | T | 1 | 2 | 2 |
| Di(4-t-butylcyclohexyl) Peroxydicarbonate | 98 | — | 88 lb (40 kg) | | 1 | 3 | 2 |
| Di-t-butyl Peroxide | 99 | — | 55 gal (208 L) | | 1 | 3 | 2 |
| Di(2-t-butylperoxyisopropyl) Benzene | 96 | — | 100 lb (45 kg) | | 1 | 2 | 2 |
| 2,4-Dichlorobenzoyl Peroxide | 50 | DBP & Silicone | 5 gal (19 L) | T | 1 | 2 | 2 |
| Didecanoyl Peroxide | 98 | — | 50 lb (23 kg) | R | 1 | 3 | 2 |
| Diisopropyl Peroxydicarbonate | 30 | Toluene | 5 gal (19 L) | R | 2 | 3 | 2 |
| 2,5-Dimethyl-2,5-di-(2-ethyl hexanoylperoxy) Hexane | 90 | — | 5 gal (19 L) | R | 0 | 3 | 2 |
| 2,5-Dimethyl-2,5-di-(t-butylperoxy) Hexane | 92 | — | 30 gal (110 L) | | 2 | 3 | 2 |
| Ethyl 3,3-Di(t-amylperoxy)Butyrate | 75 | OMS | 5 gal (19 L) | | 1 | 3 | 2 |
| Ethyl 3,3-Di(t-butylperoxy)Butyrate | 75 | OMS | 5 gal (19 L) | | 2 | 2 | 2 |
| Methyl Ethyl Ketone Peroxide | 9% AO | DMP | 5 gal (19 L) | | 3 | 2 | 2 |
| Methyl Ethyl Ketone Peroxide and Cyclohexanone Peroxide mixture | 9% AO | DMP | 5 gal (19 L) | | 3 | 2 | 2 |

R — Refrigeration required to reduce fire hazard.

T — Temperature control shall be considered to reduce fire hazard depending on packaging size and recommendations in manufacturers' literature.

AO — Active Oxygen

BBP — Butyl Benzyl Phthalate

DBP — Dibutyl Phthalate

DMP — Dimethyl Phthalate

DOP — Dioctyl Phthalate

OMS — Odorless Mineral Spirits

¹The column refers to NFPA 704, *Standard System for the Identification of Hazards of Materials for Emergency Response*, hazard ratings for health, flammability, and reactivity. See NFPA 704 for details.

(432:Table B-4.3)

Table B-3.5.3 Typical Class IV Formulations

| Organic Peroxide Formulation | Nominal Concentration, Weight Percent | Diluent | Individual Container Size | Temp. Control | Hazard Identification ¹ | | |
|------------------------------------|---------------------------------------|---------------------|---------------------------|---------------|------------------------------------|--------|------------|
| | | | | | Health | Flamm. | Reactivity |
| t-Butyl Cumyl Peroxide | 95 | — | 55 gal (208 L) | | 2 | 2 | 2 |
| t-Butyl Hydroperoxide | 70 | Water | 55 gal (208 L) | | 3 | 2 | 2 |
| t-Butyl Peroxy-2-ethylhexanoate | 50 | DOP or OMS | 5 gal (19 L) | R | 1 | 2 | 2 |
| t-Butyl Peroxypivalate | 45 | OMS | 5 gal (19 L) | R | 2 | 2 | 2 |
| Dibenzoyl Peroxide | 70 | Water | 25 lb (11 kg) | | 1 | 2 | 2 |
| Dibenzoyl Peroxide paste | 50 | Plasticizer & Water | 380 lb (170 kg) | T | 1 | 2 | 2 |
| Dibenzoyl Peroxide paste | 55 | Plasticizer & Water | 350 lb (160 kg) | T | 1 | 2 | 2 |
| Dibenzoyl Peroxide slurry | 40 | Water & Plasticizer | 80 lb (170 kg) | T | 1 | 2 | 2 |
| Dibenzoyl Peroxide slurry | 40 | Water | 5 gal (19 L) | | 1 | 2 | 2 |
| Dibenzoyl Peroxide powder | 35 | Starch | 100 lb (45 kg) | | 1 | 2 | 2 |
| Dicetyl Peroxydicarbonate | 85 | — | 20 kg drums (44 lb) | T | 1 | 2 | 2 |
| Dicumyl Peroxide | 98 | — | 55 gal (208 L) | | 2 | 2 | 2 |
| Di(2-ethylhexyl) Peroxydicarbonate | 40 | OMS | 5 gal (19 L) | R | 1 | 2 | 2 |
| Dilauroyl Peroxide | 98 | — | 110 lb (50 kg) | | 1 | 2 | 2 |
| Di(t-butylperoxy) Phthalate | 40 | DBP | 30 gal (110 L) | | 2 | 2 | 2 |
| p-Menthyl Hydroperoxide | 54 | Alcohols & Ketones | 55 gal (208 L) | T | 3 | 2 | 2 |
| Methyl Ethyl Ketone Peroxide | 5.5% AO | DMP | 5 gal (19 L) | | 3 | 2 | 2 |
| Methyl Ethyl Ketone Peroxide | 9% AO | Water & Glycols | 5 gal (19 L) | | 3 | 2 | 2 |
| 2,4-Pentanedione Peroxide | 4% AO | Water & Solvent | 5gal (19 L) | | 2 | 1 | 1 |

R — Refrigeration required to reduce fire hazard.

T — Temperature control should be considered to reduce fire hazard depending on packaging size and recommendations in manufacturers' literature.

AO — Active Oxygen

DBP — Dibutyl Phthalate

DMP — Dimethyl Phthalate

DOP — Dioctyl Phthalate

OMS — Odorless Mineral Spirits

¹The column refers to NFPA 704, *Standard System for the Identification of Hazards of Materials for Emergency Response*, hazard ratings for health, flammability, and reactivity. See NFPA 704 for details.

(432;Table B-5.3)

Table B-3.6.3 Typical Class V Formulations

| Organic Peroxide Formulation | Nominal Concentration, Weight Percent | Diluent | Individual Container Size | Temp. Control | Hazard Identification ¹ | | |
|---|---------------------------------------|--|---------------------------|---------------|------------------------------------|--------|------------|
| | | | | | Health | Flamm. | Reactivity |
| Dibenzoyl Peroxide | 35 | Dicalcium Phosphate Dihydrate or Calcium Sulfate Dihydrate | 100 lb (45 kg) | | 1 | 0 | 0 |
| Di-(2-t-butylperoxyisopropyl)-Benzene | 40 | Clay | 100 lb (45 kg) | | 1 | 1 | 0 |
| 1,1-Di-(t-butylperoxy)-3,3,5-trimethylcyclohexane | 40 | Calcium Carbonate | 100 lb (45 kg) | | 1 | 1 | 1 |
| Dicumyl Peroxide | 40 | Clay or Calcium Carbonate | 100 lb (45 kg) | | 1 | 1 | 1 |
| 2,5-Dimethyl-2,5-di-(t-butylperoxy)Hexane | 47 | Calcium Carbonate or Silica | 100 lb (45 kg) | | 1 | 1 | 1 |
| Ethyl 3,3-Di-(t-butylperoxy)Butyrate | 40 | Clay or Calcium Silicate | 100 lb (45 kg) | | 1 | 1 | 1 |

AO — Active Oxygen

¹The column refers to NFPA 704, *Standard for the Identification of the Hazards of Materials for Emergency Response*, hazard ratings for health; flammability, and reactivity. See NFPA 704 for details.

(432:Table B-6.3)

Appendix C Sample Ordinance Adopting the Fire Prevention Code

This appendix is not a part of the requirements of this NFPA document but is included for informational purposes only.

The following sample ordinance is provided to assist a jurisdiction in the adoption of this Code and is not part of this Code.

ORDINANCE NO. _____

An ordinance of the [jurisdiction] adopting the [year] edition of NFPA 1, *Fire Prevention Code*, documents listed in Chapter 32 of that Code; prescribing regulations governing conditions hazardous to life and property from fire or explosion; providing for the issuance of permits and collection of fees; repealing Ordinance No. _____ of the [jurisdiction] and all other ordinances and parts of ordinances in conflict therewith; providing a penalty; providing a severability clause; and providing for publication; and providing an effective date.

BE IT ORDAINED BY THE [governing body] **OF THE** [jurisdiction]:

SECTION 1: That the [Fire Prevention Code] and documents adopted by Chapter 32, three (3) copies of which are on file and are open to inspection by the public in the office of the [jurisdiction's keeper of records] of the [jurisdiction], are hereby adopted and incorporated into this ordinance as fully as if set out at length herein, and from the date on which this ordinance shall take effect, the provisions thereof shall be controlling within the limits of the [jurisdiction]. The same are hereby adopted as the code of the [jurisdiction] for the purpose of prescribing regulations governing conditions hazardous to life and property from fire or explosion and providing for issuance of permits and collection of fees.

SECTION 2: Any person who shall violate any provision of this code or standard hereby adopted or fail to comply therewith; or who shall violate or fail to comply with any order made thereunder; or who shall build in violation of any detailed statement of specifications or plans submitted and approved thereunder; or failed to operate in accordance with any certificate or permit issued thereunder; and from which no appeal has been taken; or who shall fail to comply with such an order as affirmed or modified by _____ or by a court of competent jurisdiction, within the time fixed herein, shall severally

for each and every such violation and noncompliance, respectively, be guilty of a misdemeanor, punishable by a fine of not less than \$ _____ nor more than \$ _____ or by imprisonment for not less than _____ days nor more than _____ days or by both such fine and imprisonment. The imposition of one penalty for any violation shall not excuse the violation or permit it to continue; and all such persons shall be required to correct or remedy such violations or defects within a reasonable time; and when not otherwise specified the application of the above penalty shall not be held to prevent the enforced removal of prohibited conditions. Each day that prohibited conditions are maintained shall constitute a separate offense.

SECTION 3: Additions, Insertions, and Changes. — That the [year] edition of NFPA 1, *Fire Prevention Code*, is amended and changed in the following respects:

[List Amendments]

SECTION 4: That ordinance No. _____ of [jurisdiction] entitled [fill in the title of the ordinance or ordinances in effect at the present time] and all other ordinances or parts of ordinances in conflict herewith are hereby repealed.

SECTION 5: That if any section, subsection, sentence, clause, or phrase of this ordinance is, for any reason, held to be invalid or unconstitutional, such decision shall not affect the validity or constitutionality of the remaining portions of this ordinance. The [governing body] hereby declares that it would have passed this ordinance, and each section, subsection, clause, or phrase hereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses, and phrases be declared unconstitutional.

SECTION 6: That the [jurisdiction's keeper of records] is hereby ordered and directed to cause this ordinance to be published. *[NOTE: An additional provision may be required to direct the number of times the ordinance is to be published and to specify that it is to be in a newspaper in general circulation. Posting may also be required.]*

SECTION 7: That this ordinance and the rules, regulations, provisions, requirements, orders, and matters established and adopted hereby shall take effect and be in full force and effect [time period] from and after the date of its final passage and adoption.

Appendix D Referenced Publications

D-1 The following documents or portions thereof are referenced within this code for informational purposes only and are thus not considered part of the requirements of this code unless also listed in Chapter 32. The edition indicated here for each reference is the current edition as of the date of the NFPA issuance of this code.

D-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers*, 1998 edition.

NFPA 13, *Standard for Installation of Sprinkler Systems*, 1999 edition.

NFPA 22, *Standard for Water Tanks for Private Fire Protection*, 1998 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 1996 edition.

NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*, 1995 edition.

NFPA 34, *Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids*, 1995 edition.

NFPA 50, *Standard for Bulk Oxygen Systems at Consumer Sites*, 1996 edition.

NFPA 50A, *Standard for Gaseous Hydrogen Systems at Consumer Sites*, 1999 edition.

NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes*, 1997 edition.

NFPA 57, *Liquefied Natural Gas (LNG) Vehicular Fuel Systems Code*, 1999 edition.

NFPA 58, *Liquefied Petroleum Gas Code*, 1998 edition.

NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*, 1996 edition.

NFPA 70, *National Electrical Code®*, 1999 edition.

NFPA 77, *Recommended Practice on Static Electricity*, 1993 edition.

NFPA 80, *Standard for Fire Doors and Fire Windows*, 1999 edition.

NFPA 86, *Standard for Ovens and Furnaces*, 1999 edition.

NFPA 92A, *Recommended Practice for Smoke-Control Systems*, 1996 edition.

NFPA 101®, *Life Safety Code®*, 2000 edition.

NFPA 170, *Standard for Fire Safety Symbols*, 1999 edition.

NFPA 232A, *Guide for Fire Protection for Archives and Records Centers*, 1995 edition.

NFPA 303, *Fire Protection Standard for Marinas and Boatyards*, 1995 edition.

NFPA 326, *Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair*, 1999 edition.

NFPA 329, *Recommended Practice for Handling Releases of Flammable and Combustible Liquids and Gases*, 1999 edition.

NFPA 407, *Standard for Aircraft Fuel Servicing*, 1996 edition.

NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers*, 2000 edition.

NFPA 501, *Standard on Manufactured Housing*, 1999 edition.

NFPA 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials*, 1998 edition.

NFPA 914, *Recommended Practice for Fire Protection in Historic Structures*, 1994 edition.

NFPA 1192, *Standard on Recreational Vehicles*, 1999 edition.

NFPA 1194, *Standard for Recreational Vehicle Parks and Campgrounds*, 1999 edition.

SFPE Handbook of Fire Protection Engineering, 2nd edition.

D-1.2 Other Publications.

D-1.2.1 API Publication. American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005-4070.

API RP 1621, *Recommended Practice for Bulk Liquid Stock Control at Retail Outlets*, 1993.

D-1.2.2 ASHRAE Publication. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329-2305.

ANSI/ASHRAE 15, *Safety Code for Mechanical Refrigeration*, 1994.

D-1.2.3 AWS Publication. American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

ANSI/AWS F-4.1, *Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping*, 1994.

D-1.2.4 AWWA Publication. American Water Works Association Inc., 6666 West Quincy Avenue, Denver, CO 80235.

AWWA M14, *Backflow Prevention and Cross-Connection Control*, 1990 edition.

D-1.2.5 CGA Publication. Compressed Gas Association, 1725 Jefferson Davis Highway, Arlington, VA 22202-4100.

CGA C-7, *Guide to the Precautionary Labeling and Marking of Compressed Gas Containers*, 1992.

D-1.2.6 CSA Publication. Canadian Standards Association, 178 Rexdale Boulevard, Rexdale (Toronto) Ontario, Canada M9W 1R3.

CAN 3-B44, *Safety Code for Elevators*, including Supplement No. 1, 1987.

D-1.2.7 PEI Publication. Petroleum Equipment Institute, P.O. Box 2380, Tulsa, OK 74101.

PEI RP200, *Recommended Practices for Installation of Above-ground Storage Systems for Motor Vehicle Fueling*, 1996.

D-1.2.8 U.S. Government Publication. U.S. Government Printing Office, Washington, DC, 20402.

Title 29, *Code of Federal Regulations*, Labor.

D-1.2.9 Additional Publications.

Farm Chemicals Handbook, Meister Publishing Co., Willoughby, OH, 1997.

Introduction to Performance-Based Fire Safety, Society of Fire Protection Engineers, 7315 Wisconsin Avenue, No. 1225W, Bethesda, MD 20814-3202, 2000.

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