NFPA 1
Fire Prevention Code

1997 Edition

National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

IMPORTANT NOTICE ABOUT THIS DOCUMENT

NFPA codes, standards, recommended practices, and guides, of which the document contained herein is one, are developed through a consensus standards development process approved by the American National Standards Institute. This process brings together volunteers representing varied viewpoints and interests to achieve consensus on fire and other safety issues. While the NFPA administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards.

The NFPA disclaims liability for any personal injury, property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on this document. The NFPA also makes no guaranty or warranty as to the accuracy or completeness of any information published herein.

In issuing and making this document available, the NFPA is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the NFPA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

The NFPA has no power, nor does it undertake, to police or enforce compliance with the contents of this document. Nor does the NFPA list, certify, test or inspect products, designs, or installations for compliance with this document. Any certification or other statement of compliance with the requirements of this document shall not be attributable to the NFPA and is solely the responsibility of the certifier or maker of the statement.

NOTICES

All questions or other communications relating to this document and all requests for information on NFPA procedures governing its codes and standards development process, including information on the procedures for requesting Formal Interpretations, for proposing Tentative Interim Amendments, and for proposing revisions to NFPA documents during regular revision cycles, should be sent to NFPA headquarters, addressed to the attention of the Secretary, Standards Council, National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

Users of this document should be aware that this document may be amended from time to time through the issuance of Tentative Interim Amendments, and that an official NFPA document at any point in time consists of the current edition of the document together with any Tentative Interim Amendments then in effect. In order to determine whether this document is the current edition and whether it has been amended through the issuance of Tentative Interim Amendments, consult appropriate NFPA publications such as the *National Fire Codes*® Subscription Service, visit the NFPA website at www.nfpa.org, or contact the NFPA at the address listed above.

A statement, written or oral, that is not processed in accordance with Section 5 of the Regulations Governing Committee Projects shall not be considered the official position of NFPA or any of its Committees and shall not be considered to be, nor be relied upon as, a Formal Interpretation.

The NFPA does not take any position with respect to the validity of any patent rights asserted in connection with any items which are mentioned in or are the subject of this document, and the NFPA disclaims liability for the infringement of any patent resulting from the use of or reliance on this document. Users of this document are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

Users of this document should consult applicable federal, state, and local laws and regulations. NFPA does not, by the publication of this document, intend to urge action that is not in compliance with applicable laws, and this document may not be construed as doing so.

NFPA 1

Fire Prevention Code

1997 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 Fall Meeting held November 18–20, 1996, in Nashville, TN. It was issued by the Standards Council on January 17, 1997, with an effective date of February 7, 1997, and supersedes all previous editions.

This edition of NFPA 1 was approved as an American National Standard on February 21, 1997.

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 utilized the other developed NFPA standards and codes. 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 a task of developing a code that was more self contained, adding administrative sections and extracting heavily from other NFPA codes and standards. This 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 combustible and flammable materials. Chapters extracting hazardous material requirements place greater emphasis on protection of life and property from chemical products made and used in the environment. This major rewrite resulted in the 1992 edition of the *Fire Prevention Code*.

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

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.

Technical Committee on Fire Prevention Code

Walter Smittle, *Chair*
West Virginia State Fire Marshal, WV [E]
Rep. Fire Marshals Assn. of North America

Stanley E. Anderson, Rohm and Haas Texas Inc., TX [U]
John R. Bazemore, U.S. Air Force, CO [U]
John F. Bender, Maryland Office of State Fire Marshal, MD [E]
James W. Bowman, The DuPont Company, DE [U]
William J. Bradford, Brookfield, CT [SE]
Charles E. Brown, City of Winter Haven Fire Dept., FL [E]
Rep. NFPA Fire Service Section
Gene B. Endthoff, Nat'l Fire Sprinkler Assn., IL [SE]
Rep. Nat'l Fire Sprinkler Assn.
Alfred J. Hogan, Reedy Creek Improvement District, FL [E]
Thomas W. Jaeger, Gage Babcock & Assoc., Inc., VA [SE]
Robert J. James, MountainStar Enterprises, Ltd, MN [SE]
Richard S. Kraus, Petroleum Safety Consultants, VA [U]
Rep. American Petroleum Inst.
Bernard P. Lally, New York City Fire Dept., NY [E]
John K. Landry, USF&G Insurance Co., MD [I]
Rep. American Insurance Services Group, Inc.
Ronald K. Mengel, Pittway Systems Technology Group, IL [M]
Rep. Nat'l Electrical Mfrs. Assn.
Wayne D. Moore, MBS Fire Technology, Inc., GA [M]
Rep. Automatic Fire Alarm Assn., Inc.
Richard Oggero, The Weitz Co. Inc., IA [C]
Wade Schaefer, Michigan State Fire Marshals Office, MI [E]
Rep. Fire Marshals Assn. of North America
Chester W. Schirmer, Schirmer Engr Corp., NC [SE]
Stanley Wheeler, City of Livermore, CA [E]
Rep. NFPA/AEBO, ICBO
Dean K. Wilson, Industrial Risk Insurers, CT [I]
Rep. Industrial Risk Insurers

Alternates

Carl F. Baldassarra, Schirmer Engr Corp., IL [SE]
(Alt. to C. W. Schirmer)
William Hopple, Simplex Time Recorder Co., CA [M]
(Alt. to R. K. Mengel)
Gerald E. Lingenfelter, American Ins Services Group Inc., NY [I]
(Alt. to J. K. Landry)
Patrick C. Ward, Gage-Babcock & Assoc., Inc., CA [SE]
(Alt. to T. W. Jaeger)
Peter J. Gore Willse, Industrial Risk Insurers, CT [I]
(Alt. to D. K. Wilson)

Carl E. Peterson, NFPA Staff Liaison

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

Contents

NFPA 1

Fire Prevention Code

1997 Edition

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

A reference in parentheses ( ) following a section or paragraph indicates material that has been extracted from another NFPA document. The complete title and current edition of an extracted and referenced document are found in Chapter 43. Editorial changes to extracted material consist of reference changes referring the user to an appropriate reference in this Code or the inclusion of the document number being referenced in the original extracted material. Requests for interpretations or revisions of extracted text should be addressed to the appropriate Technical Committee.

Information on referenced publications can be found in Chapter 43 and Appendix D.

PART I ADMINISTRATION AND ENFORCEMENT

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 intent 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. The scope covers the construction, maintenance, and use of property to the extent that such is not covered by existing NFPA codes and standards. When other codes and standards are applicable to the scope of this standard they are referenced herein.

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 provisions of this Code are applicable to:

(a) The inspection of buildings, processes, equipment, systems, and other fire and related life safety situations

(b) The investigation of fires, explosions, hazardous materials incidents, and other related emergency incidents handled by the fire department

(c) 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

(d) The fire and life safety education of fire brigades, employees, responsible parties, and the general public

(e) Existing occupancies and conditions, the design and construction of new buildings, remodeling of existing buildings, and additions to existing buildings

(f) The storage, use, processing, handling, and transportation of hazardous materials

(g) The design, alteration, modification, construction, maintenance, and testing of fire protection systems and equipment

(h) Access requirements for fire department operations

(i) Hazards from outside fires in vegetation, trash, building debris, and other materials

(j) The regulation and control of special events including but not limited to exhibits, trade shows, amusement parks, haunted houses, and other similar special occupancies

(k) The interior finish, decorations, furnishings, and other combustibles that contribute to fire spread, fire load, and smoke production

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 applies to both new and existing conditions. In various chapters there are specific provisions for existing facilities that might differ from those for new facilities.

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 43 of this Code shall be considered a part of this Code to the extent called for by Chapters 1 through 42 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 43-1.1 shall be permitted to be continued in use, unless the authority having jurisdiction determines that the lack of conformity with these 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 1-8.2.

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 defined by 30-1.3 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 Board of Appeals.

1-7.1 A Board of Appeals is hereby established consisting of members and alternate members who shall be appointed by

the (Name of Appointing Official) 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.

1-7.2 Board members shall not be officers, agents, or employees of this jurisdiction. All members and any alternate members shall be appointed and 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.

1-7.3 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.

1-7.4 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.

1-7.5 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.

1-7.6 Means of Appeals.

1-7.6.1 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:

(a) The true intent of the codes or ordinances described in this Code has been incorrectly interpreted

(b) The provisions of the codes or ordinances do not fully apply

(c) A decision is unreasonable or arbitrary as it applies to alternatives or new materials

1-7.6.2 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.

1-8 Occupancy.

1-8.1 No new construction or existing building shall be occupied in whole or in part in violation of the provisions of this Code.

1-8.2 Existing buildings that are occupied at the time of adoption of this Code shall remain in use provided:

(a) The occupancy classification remains the same

(b) *There exists no condition deemed hazardous to life or property that would constitute an imminent danger

1-8.3* 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.

1-8.4* Changes of Occupancy.

1-8.4.1 In any building or structure, whether necessitating a physical alteration or not, a change from one occupancy classification to another, or from one occupancy subclassification to another subclassification of the same occupancy, shall be permitted only if such structure, building, or portion thereof conforms with the requirements of NFPA *101, Life Safety Code* applying to new construction for the proposed new use. (**101:**1-3.12)

1-8.4.2 Occupancy and subclassifications, as defined, shall be in accordance with NFPA *101, Life Safety Code.*

1-9 Maintenance and Testing.

1-9.1 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,* 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:**1-3.13.1)

1-9.2* Any nonrequired system that creates an unsafe or hazardous condition shall be removed.

1-9.3 Existing life safety features such as, but not limited to, automatic sprinklers, fire alarm systems, standpipes, and horizontal exits, if not required by this Code or NFPA *101,* either shall be maintained or removed. (**101:**1-3.13.2)

1-9.4 Equipment requiring periodic testing or operation to ensure its maintenance shall be tested or operated as specified elsewhere in this Code or NFPA *101,* or as directed by the authority having jurisdiction.

1-9.5 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:**1-3.13.4)

1-9.6 Periodic Testing of Emergency Lighting Equipment. A functional test shall be conducted on every required battery-powered emergency lighting system at 30-day intervals for a minimum of 30 sec. An annual test shall be conducted for a 1 $^1/_2$-hr duration. 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 minimum 30-sec test and diagnostic routine at least once every 30 days and indicates failures by a status indicator shall be exempt from the 30-day functional test, provided a visual inspection is performed at 30-day intervals. (***101***:5-9.3)*

1-9.7 Emergency Generators. Emergency generators, where required for compliance with this Code and NFPA *101,* shall be tested and maintained in accordance with NFPA *110, Standard for Emergency and Standby Power Systems.* (**101:**7-1.3)

1-9.8 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 7-4.4 and 7-4.5 of NFPA *101* 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:**7-4.8)

1-10 Records and Reports.

1-10.1 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.

1-10.2 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.

1-10.3 All records required to be kept shall be maintained until their usefulness has been served or as otherwise required by law.

1-10.4 The authority having jurisdiction shall be permitted to require facilities regulated by Chapter 27 to develop and maintain a hazardous materials management plan and hazardous materials inventory statement.

1-11 Duties and Powers of the Incident Commander.

1-11.1 The incident commander conducting operations in connection with the extinguishment and control of any fire, explosion, or other emergency shall have authority to direct all operations of fire extinguishment 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.

1-11.2 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.

1-11.3 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.

1-12 Owner/Occupant Responsibilities.

1-12.1 The owner, operator, or occupant shall be responsible for compliance with this Code.

1-12.2 The authority having jurisdiction shall be permitted to require tests or test reports as proof of compliance with the intent of this Code.

1-12.3 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.

1-13 Fire Reporting, False Alarms.

1-13.1 The person discovering any fire, regardless of magnitude, shall:

(a) Immediately notify the person in charge of the premises and all occupants and guests in the immediate vicinity of the fire

(b) Notify the fire department

Exception: Whenever an unwanted fire occurs in any building or on any premises of any kind, 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. This requirement shall 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.

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.

Paragraph 1-13.1(b) 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.

1-13.2 No person shall deliberately or maliciously turn in an alarm of fire when in fact that person knows that no fire exists.

1-13.3 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.

1-14 Tampering With Fire Safety Equipment.

1-14.1 No person shall render any portable or fixed fire extinguishing system or device or any fire warning system inoperative or inaccessible except as necessary during emergencies, maintenance, drills, or prescribed testing.

1-14.2 No person shall render a system or device inoperative during an emergency unless by direction of the incident commander.

1-14.3 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.

1-15 Permits and Approvals.

1-15.1 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.

Exception: Paragraph 1-15.1 shall not apply to facilities that have in place a plan or procedure to ensure the fire-safe operation of the facility as required by Section 1-15. Such a plan or procedure must be approved by the authority having jurisdiction.

1-15.2 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.

1-15.3 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.

1-15.4 Revocation shall be constituted when the permittee is duly notified by the authority having jurisdiction.

1-15.5 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.

1-15.6 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.

1-15.7 The authority having jurisdiction shall have the authority to require an inspection prior to the issuance of a permit.

1-15.8 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.

1-15.9 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.

1-15.10 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.

1-15.11 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.

1-15.12 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.

1-15.13 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.

1-15.14* 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:

(a) Operation or activities for which the permit is issued

(b) Address or location where the operation or activity is to be conducted

(c) Name and address of the permittee

(d) Permit number and date of issuance

(e) Period of validity of the permit

(f) Inspection requirements

1-15.15 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.

1-15.16 The authority having jurisdiction shall have the authority to issue permits for the following operations within the jurisdiction:

(a) *Amusement Parks.* Construction, alteration, or operation of amusement park fire protection safety features.

(b) *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.

(c) *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.

(d) *Bowling Lanes.* Refinishing and resurfacing of bowling lanes and bowling pin refinishing.

(e) *Cellulose Nitrate Film.* Storage, handling, or use of cellulose nitrate film.

(f) *Combustible Fibers.* Storage or handling of combustible fibers covered by Chapter 39 of this Code.

(g) *Compressed Gases.* Storage, handling, or use of compressed gases. Installation or modification of any compressed gas system.

(h) *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, holiday sales, etc. Other trade shows and exhibits held in the mall shall require a separate trade show/exhibit permit.

(i) *Cutting and Welding.* Cutting or welding operations within the jurisdiction.

(j) *Dust Explosion Prevention.* Installation, modification, or operation of the following:

1. Grain bleacher or elevator
2. Starch, flour, or feed mill
3. Malt house
4. Wood flour manufacturing plant
5. Aluminum, coal, cocoa, magnesium, spices, sugar, or other facility that pulverizes materials subject to dust explosion
6. Any central dust collection system
7. Any equipment that produces significant amounts of dust subject to explosion

(k) *Exhibit and Trade Shows.* Operation of all exhibits and trade shows held within the jurisdiction.

(l) *Explosives*:

1. Manufacture, sell, dispose, purchase, storage, use, possess, or transport of explosives within the jurisdiction
2. A separate permit, valid for no more than 90 days, shall be required to conduct blasting operations

(m) *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 Chapter 8 is not considered a modification and does not require a permit.

(n) *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 Section 6-4 is not considered a modification and does not require a permit.

(o) *Fireworks.* Possession, storage, manufacture, sale, or discharge of fireworks within the jurisdiction.

(p) *Flammable and Combustible Liquids*:

1. Storage, use, handling, or transportation of Class I, Class II, or Class IIIA flammable or combustible liquids
2. Installation, modification, removal, abandonment, defueling, or slurry fill of storage tanks
3. Manufacture, processing, blending, or refining
4. Operation of cargo tankers that transport flammable and combustible liquids

(q) *Flammable Finished Application.* The spray application of flammable or combustible liquids. Installation or modification of any spray room or booth

(r) *Storage of Oxidizers and Organic Peroxides Regulated by Chapter 27*:

1. Materials classified as having more than one hazard category if the quantity limits are exceeded in any category
2. Repair, abandon, remove, place temporarily out-of-service, close, or substantially modify a storage facility
3. 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
4. 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.
5. Storage, handling, or use of chlorine
6. Installation or modification to any chlorine gas system

(s) *Industrial Ovens.* Operation of industrial ovens covered by Chapter 36.

Exception No. 1: Routine maintenance.

Exception No. 2: For emergency repair work performed on an emergency basis, application for permit shall be made within two working days of commencement of work.

(t) *LP-Gas*:

1. Storage and use of LP-Gas
2. Installation of or modification to any LP-Gas system
3. Operation of any cargo tankers that transport LP-Gas

(u) *Lumber Yards and Woodworking Plants.* Storage of lumber exceeding 100,000 board ft.

(v) *Magnesium.* Storage, handling, or processing of magnesium in quantities deemed significant by the authority having jurisdiction.

(w) *Organic Coatings.* Operation and maintenance of a facility that manufactures organic coatings.

(x) *Outdoor Storage of Scrap Tires.* Establish, conduct, or maintain any outdoor storage of scrap tires that exceeds 2,500 ft^3 of total volume of scrap tires.

(y) *Pyroxylin Plastics.* Storage, handling, assembly, or manufacture of pyroxylin plastics.

(z) *Private Fire Hydrants.* Installation, modification, or removal from service of any private fire hydrants.

(aa) *Repair Garages and Service Stations.* Operation of repair garages and service stations.

(bb) *Tar Kettles.* Permit shall be obtained at least two working days prior to the placement of a tar kettle.

(cc) *Roof Top Heliports.* Construction, modification, or operation of a roof top heliport.

(dd) *Standpipe Systems.* Installation, modification, or removal from service of any standpipe system. Maintenance performed in accordance with Section 6-2 is not considered a modification and does not require a permit.

(ee) *Tire Rebuilding Plants.* Operation and maintenance of a tire rebuilding plant.

1-16 Certificates of Fitness.

1-16.1 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:

(a) Use of explosive materials
(b) Blasting or demolition operations
(c) Fireworks displays
(d) Inspection, servicing, or recharging of portable fire extinguishers
(e) Servicing or recharging of fixed fire extinguishing systems
(f) Servicing of fire alarm or fire communication systems
(g) Servicing of gas- or oil-burning heating systems
(h) Chimney sweep operations
(i) Inspection or servicing of range-hood systems
(j) Installation or servicing of chlorine systems

1-16.2 Where certificates of fitness are required, the authority having jurisdiction shall be responsible for their issuance.

1-16.3 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.

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

1-16.5 All applications for a certificate of fitness shall be filed with the authority having jurisdiction on forms provided by the authority having jurisdiction.

1-16.6 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.

1-16.7 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.

1-16.8 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.

1-16.9 Certificates of fitness shall not be transferable.

1-16.10 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.

1-16.11 Applications for renewal of a certificate of fitness shall be filed in the same manner as an application for an original certificate.

1-16.12 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.

1-16.13 A certificate of fitness shall be in the form of an identification card. The card shall contain the following information:

(a) The purpose for which the certificate of fitness is issued

(b) The date of expiration

(c) Information necessary to properly identify the person to whom the certificate of fitness is issued

(d) The signature of the person to whom the certificate of fitness is issued

(e) The name and signature of the authority having jurisdiction or a designated representative

(f) Printed thereon in bold type the following: "THIS CERTIFICATE IS NOT AN ENDORSEMENT OF THIS PERSON BY THE AUTHORITY HAVING JURISDICTION."

1-16.14 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.

1-17 Plans Review.

1-17.1 For new construction, modification, or rehabilitation, the authority having jurisdiction shall have the authority to review construction documents and shop drawings.

1-17.2 It shall be the responsibility of the applicant to ensure that:

(a) The construction documents include all of the fire protection requirements

(b) The shop drawings are correct and in compliance with the applicable codes and standards

1-17.3 It shall be the responsibility of the authority having jurisdiction to promulgate rules that cover the following:

(a) Criteria to meet the requirements of Section 1-17

(b) Review of documents and shop drawings within established time frames for the purpose of acceptance or providing reasons for nonacceptance.

1-17.4 Review and approval by the authority having jurisdiction shall not relieve the applicant of the responsibility of compliance with this Code.

1-17.5 Where field conditions necessitate any substantial change from the approved plan, the authority having jurisdiction shall have the authority to require the corrected plans be submitted for approval.

1-18 Notice of Violations, Penalties.

1-18.1 Whenever the authority having jurisdiction determines violations of this Code, a written notice shall be issued to confirm such findings.

1-18.2 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, 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.

1-18.3 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.

1-18.4 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.

PART II DEFINITIONS

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.

Addition. An extension or increase in floor area or height of a building or structure. (**101:**3-2)

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

Ambulatory Health Care Facilities. A building or part of a building used to provide services or treatment to four or more patients at the same time that meets the criteria of either (a) or (b) below.

(a) Facilities that provide, on an outpatient basis, treatment for patients incapable of taking action for self-preservation under emergency conditions without assistance from others.

(b) Facilities that provide, on an outpatient basis, surgical treatment requiring general anesthesia. (**101:**12-1.3)

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

Apartment Buildings. Buildings containing three or more dwelling units with independent cooking and bathroom facilities, whether designated as apartment houses, tenements, garden apartments, or by any other name. (**101:**18-1.3)

Approved.* Acceptable to the authority having jurisdiction.

Assembly Occupancy. Assembly occupancies include, but are not limited to, all buildings or portions of buildings used for gathering together 50 or more persons for such purposes as deliberation, worship, entertainment, eating, drinking, amusement, or awaiting transportation. Assembly occupancies also include special amusement buildings regardless of occupant load. *(See 8-4.7 and 9-4.7 of* NFPA *101.)*

Assembly occupancies include:

- Armories
- Assembly halls
- Auditoriums
- Bowling lanes
- Club rooms
- College and university classrooms, 50 persons and over
- Conference rooms
- Courtrooms
- Dance halls
- Drinking establishments
- Exhibition halls
- Gymnasiums
- Libraries
- Mortuary chapels
- Motion picture theaters
- Museums
- Passenger stations and terminals of air, surface, underground, and marine public transportation facilities
- Places of religious worship
- Pool rooms
- Recreation piers
- Restaurants
- Skating rinks
- Theaters

Occupancy of any room or space for assembly purposes by fewer than 50 persons in a building or other occupancy and incidental to such other occupancy shall be classified as part of the other occupancy and shall be subject to the provisions applicable thereto. (**101:**4-1.2)

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

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.

Basement. A story with more than 50 percent of its perimeter below grade.

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.

Building. Any structure used or intended for supporting or sheltering any use or occupancy. The term building shall be construed as if followed by the words "or portions thereof." (**101:**3-2)

Building, Existing. Any structure erected or officially authorized prior to the effective date of the adoption of this edition of the Code by the agency or jurisdiction. (**101:**3-2)

Business Occupancies. Business occupancies are those used for the transaction of business (other than those covered under "Mercantile"), for the keeping of accounts and records, and for similar purposes.

Business occupancies include:

- Air traffic control towers (ATCTs)
- City halls
- College and university instructional buildings, classrooms under 50 persons, and instructional laboratories
- Courthouses
- Dentists' offices
- Doctors' offices
- General offices
- Outpatient clinics, ambulatory
- Town halls

(**101:**4-1.8)

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.

CFR. The Code of Federal Regulations of the United States Government.

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.

Combustible. Capable of undergoing combustion. (**101:**3-2)

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

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.

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.

Combustion. A chemical process that involves oxidation sufficient to produce light or heat. (**101:**3-2)

Construction Documents. Documents that consist of scaled design drawings and specifications for the purpose of construction of new facilities or modification to existing facilities. *(Also see definition of "Shop Drawings".)*

Container. Any vessel of 60 U.S. gal (227 L) or less capacity used for transporting or storing liquids.

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.

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

Detention and Correctional Occupancies. Detention and correctional occupancies are used to house individuals under varied degrees of restraint or security and are occupied by persons who are mostly incapable of self-preservation because of security measures not under the occupants' control.

Detention and correctional occupancies include:

Adult and juvenile substance abuse centers	Adult local detention facilities
Adult and juvenile work camps	Juvenile community residential centers
Adult community residential centers	Juvenile detention facilities
Adult correctional institutions	Juvenile training schools

Chapters 14 and 15 of NFPA *101* address the residential housing areas of the detention and correctional occupancy as defined by 14-1.3 and 15-1.3 of NFPA *101*. Other uses within detention and correctional facilities, such as gymnasiums or industries, shall be in accordance with the appropriate chapter of NFPA *101*. (**101:**4-1.5)

Dormitories. Buildings or spaces in buildings where 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. Examples are college dormitories, fraternity houses, and military barracks. Rooms within dormitories intended for the use of individuals for combined living and sleeping purposes shall be deemed "guest rooms" or "guest suites" as indicated in Chapter 16 of NFPA *101* unless specifically excepted. (**101:**16-1.3)

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.

Educational Occupancies. Educational occupancies include all buildings or portions of buildings 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.

Educational occupancies include:

Academies	Nursery schools
Kindergartens	Schools

Other occupancies associated with educational institutions shall be in accordance with the appropriate parts of NFPA *101*.

In cases where instruction is incidental to some other occupancy, the section of NFPA *101* governing such other occupancy shall apply. (**101:**4-1.3)

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

Existing. That which is already in existence on the date when this edition of the Code goes into effect.

Existing Condition. Any situation, circumstance, or process that was ongoing or in effect prior to the adoption of this Code.

Exit. That portion of a means of egress that is separated from all other spaces of the building or structure by construction or equipment as required in 5-1.3.2.1 of NFPA *101* to provide a protected way of travel to the exit discharge. Exits include exterior exit doors, exit passageways, horizontal exits, separated exit stairs, and separated exit ramps. (**101:**3-2)

Exit Access. That portion of a means of egress that leads to an exit. (**101:**3-2)

Exit Discharge. That portion of a means of egress between the termination of an exit and a public way. (**101**:3-2)

Fire Compartment. A space, within a building, that is enclosed by fire barriers on all sides, including the top and bottom. (**101:**3-2)

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

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 a fire or explosion and that poses a threat to life or property.

Fire Hydrant. A valved connection on a water supply system having one or more outlets used to supply hose and fire department pumpers with water.

Fire Protection System. Any fire alarm device or system, or fire extinguishing device or system, or combination thereof, designed and installed for detecting, controlling, or extinguishing a fire or otherwise alerting occupants, the fire department, or both that a fire has occurred.

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

Fire Watcher. A person assigned to be in an area for the express purpose of notifying the fire department of an emergency, preventing a fire from occurring, extinguishing small fires, or protecting the public from fire or life safety dangers addressed in this Code. Specific requirements for personnel, their training, and any equipment are found in the appropriate sections of this Code.

Flame Spread. The propagation of flame over a surface. (**101:**3-2)

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.*

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. Where the term "area" is used elsewhere in this Code and NFPA *101*, it shall be understood to be gross area unless otherwise specified. (**101:**3-2)

Floor Area, Net. Net floor area shall be the actual occupied area, not including accessory unoccupied areas or thickness of walls. (**101:**3-2)

Gallon. One U.S. Standard Gallon (4 L).

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

Guide. A document that is advisory or informative in nature and that contains only nonmandatory provisions. A guide may contain mandatory statements such as when a guide can be used, but the document as a whole is not suitable for adoption into law.

Hazard of Contents.

*Low Hazard.** Low hazard contents shall be classified as those of such low combustibility that no self-propagating fire therein can occur. (**101:**4-2.2.2)

*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:**4-2.2.3)

*High Hazard.** High hazard contents shall be classified as those that are likely to burn with extreme rapidity or from which explosions are likely. (**101:**4-2.2.4)

Health Care Occupancies. Health care occupancies are those used for purposes such as medical or other treatment or care of persons suffering from physical or mental illness, disease, or infirmity; and for the care of infants, convalescents, or infirm aged persons. Health care occupancies provide sleeping facilities for four or more occupants and are occupied by persons who are mostly incapable of self-preservation because of age, physical or mental disability, or because of security measures not under the occupants' control.

Health care occupancies include:

Hospitals

Limited care facilities

Nursing homes

Health care occupancies also include ambulatory health care centers. (**101:**4-1.4)

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

High-Rise Building. A building more than 75 ft (23 m) in height. Building height shall be measured from the lowest level of fire department vehicle access to the floor of the highest occupiable story. (**101:**3-2)

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:**5-1.2)

Hospital. A building or part thereof used on a 24-hour basis for the medical, psychiatric, obstetrical, or surgical care of four or more inpatients. The term hospital, wherever used in this Code or NFPA *101*, shall include general hospitals, psychiatric hospitals, and specialty hospitals. (**101:**12-1.3)

Hotels. Buildings or groups of buildings under the same management in which there are sleeping accommodations for more than 16 persons primarily used by transients (those who occupy accommodations for less than 30 days) for lodging with or without meals, whether designated as a hotel, inn, club, motel, or by any other name. So-called apartment hotels shall be classified as hotels because they are potentially subject to the same transient occupancy as hotels. (**101:**12-1.3)

Incident Commander. The fire department official in charge of an emergency incident.

Indicating Valve. A valve that has components that show if the valve is open or closed. Examples are OS&Y gate valves and underground gate valves with indicator posts.

Industrial Occupancies. Industrial occupancies include factories making products of all kinds and properties devoted to operations such as processing, assembling, mixing, packaging, finishing or decorating, and repairing.

Industrial occupancies include:

Dry-cleaning plants	Laundries
Factories of all kinds	Power plants
Food processing plants	Pumping stations
Gas plants	Refineries
Hangars (for servicing/ maintenance,	Sawmills
	Telephone exchanges

(**101:**4-1.9)

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)

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

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.

Keybox. A container of a type approved by the authority having jurisdiction installed in an accessible location for the purpose of containing keys to gain necessary access to areas of the premises.

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.

Limited Care Facility. A building or part 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 mental limitations such as mental retardation/developmental disability, mental illness, or chemical dependency. (**101:**12-1.3)

Liquefied Natural Gas. A fluid in the liquid state composed predominantly of methane and that may contain minor quantities of ethane, propane, nitrogen, or other components normally found in natural gas.

Liquefied Petroleum 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).

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 identified standards or has been tested and found suitable for a specified purpose.

Lodging or Rooming Occupancies. Buildings that provide sleeping accommodations for a total of 16 or fewer persons on either a transient or permanent basis, with or without meals, but without separate cooking facilities for individual occupants except as provided in Chapter 21 of NFPA *101*. (**101**:20-1.1)

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

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: (a) the exit access, (b) the exit, and (c) the exit discharge. (**101:**5-1.2)

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:**3-2)

Mercantile Occupancies. Mercantile occupancies include stores, markets, and other rooms, buildings, or structures for the display and sale of merchandise. Mercantile occupancies include:

Auction rooms	Shopping centers
Department stores	Supermarkets
Drugstores	

(**101:**4-1.7)

Mezzanine. An intermediate level between the floor and the ceiling of any room or space. (**101:**3-2)

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

Noncombustible Material. A material that, in the form in which it is used and under the conditions anticipated, will not aid combustion or add appreciable heat to an ambient fire. Materials, where tested in accordance with ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, and conforming to the criteria contained in Section 7 of the referenced standard shall be considered as noncombustible materials.

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.

Nursing Home. A building or part 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. The term "nursing home," wherever used in this Code or NFPA *101*, shall include nursing and convalescent homes, skilled nursing facilities, intermediate care facilities, and infirmaries in homes for the aged. (**101:**12-1.3)

Occupancy. The purpose for which a building or portion thereof is used or intended to be used. (**101:**3-2)

Occupant Load. The total number of persons that might occupy a building or portion thereof at any one time. (**101:**3-2)

Occupiable Story. A story occupied by people on a regular basis. Stories used exclusively for mechanical equipment rooms, elevator penthouses, and similar spaces are not occupiable stories. (**101:**3-2)

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:**21-1.1.1)

OSHA. The Occupational Safety and Health Administration.

Patch Kettle. Any pot or container with a capacity of less than 6 gal (22.71 L) used for preheating tar, asphalt, pitch, or similar substances for the repair of roofs, streets, floors, pipes, or similar objects.

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

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

Personal Care. The care of residents who do not require chronic or convalescent medical or nursing care. Personal care involves responsibility for the safety of the resident while inside the building. Personal care might include daily awareness by the management of the resident's functioning and whereabouts, making and reminding a resident of appointments, the ability and readiness for intervention in the event of a resident experiencing a crisis, supervision in the areas of nutrition and medication, and actual provision of transient medical care. (**101:**22-1.3)

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

Private Building. Any building, or that portion of a building, that is normally not frequented by, nor open to, the public.

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

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

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

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.

Public Way. Any 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:**3-2)

Ramp. A walking surface that has a slope steeper than 1 in 20. (**101:**5-1.2)

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.

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.

Residential Board and Care Occupancies. A building or part 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:**22-1.3)

Residential Occupancies. Those occupancies in which sleeping accommodations are provided for normal residential purposes and include all buildings designed to provide sleeping accommodations.

Exception: Those classified under health care or detention and correctional occupancies.

Residential occupancies are treated separately in this Code and in NFPA *101* in the following groups:

(a) Hotels, motels, and dormitories

(b) Apartment buildings

(c) Lodging or rooming houses

(d) One- and two-family dwellings

(e) Board and care facilities (**101:**4-1.6)

Segregated. Physically separated from other materials by adequate space, walls, or partitions and in accordance with the recommendations of the manufacturer of the stored material.

Self-Closing. Equipped with an approved device that will ensure closing after having been opened. (**101:**3-2)

Shall. Indicates a mandatory requirement.

Shop Drawings. For the purposes of this Code, shop drawings are scaled working drawings, equipment cutsheets, and design calculations. *(See definition of "Construction Documents".)*

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

Smoke Barrier. A continuous membrane, either vertical or horizontal, such as a wall, floor, or ceiling assembly, that is designed and constructed to restrict the movement of smoke. A smoke barrier might or might not have a fire resistance rating. Such barriers might have protected openings. (**101:**3-2)

Smoke Compartment. A smoke compartment is a space within a building enclosed by smoke barriers on all sides, including the top and bottom. (**101:**3-2)

Smoke Detector. A device that senses visible or invisible particles of combustion. (**101:**3-2)

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

Special Uses. Shall include, but not be limited to, events or occurrences where threatening life safety situations or fire hazards exist or are likely to exist as determined by the authority having jurisdiction.

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.

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)

Storage Occupancies. Storage occupancies include all buildings or structures utilized primarily for the storage or sheltering of goods, merchandise, products, vehicles, or animals.

Storage occupancies include:

Barns	Hangars (for storage only)
Bulk oil storage	Parking structures
Cold storage	Stables
Freight terminals	Truck and marine terminals
	Warehouses
Grain elevators	

(**101:**4-1.10)

Story. That portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above. (**101:**3-2)

STP (Standard Temperature and Pressure). A temperature of 70°F (21.1°C) and a pressure of 1 atmosphere (14.7 psi or 760 mm Hg).

Street. Any public thoroughfare (road, avenue, boulevard) 30 ft (9.1 m) or more in width that has been dedicated or deeded to the public for public use and is accessible for use by the fire department in fighting fire. Enclosed spaces and tunnels, even though used for vehicular and pedestrian traffic, are not considered as streets for the purposes of this Code and NFPA *101*. (**101:**3-2)

Street Floor. Any story or floor level accessible from the street or from outside the building at ground level with floor level at the main entrance not more than three risers above or below ground level at these points, and arranged and utilized to qualify as the main floor. Where, due to differences in street levels, there are two or more stories accessible from the street, each is a street floor for the purposes of this Code. Where there is no floor level within the specified limits for a street floor above or below ground level, the building shall be considered as having no street floor. (**101:**3-2)

Structure. That which is built or constructed. The term "structure" shall be construed as if followed by the words "or portion thereof." (**101:**3-2)

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

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

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.

Water Capacity. The volumetric measure of the amount of water a container can hold.

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.

PART III GENERAL FIRE SAFETY REQUIREMENTS

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 It shall be illegal for any person to throw or place, or cause to be thrown or placed, any lighted match, cigar, cigarette, matches, or other flaming or glowing substance or thing on any surface or article where it can cause or start a fire.

3-1.4 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.

3-1.5 Fire exit drills shall be conducted regularly in occupancies where specified by Chapters 9 through 25 or by appropriate action of the authority having jurisdiction. Drills shall be designed in cooperation with the authority having jurisdiction.

3-1.6 Factors Affecting Egress.

3-1.6.1 No furnishings, decorations, or other objects shall be placed to obstruct exits, access thereto, egress therefrom, or visibility thereof. (**101:**5-1.9.2.1)

3-1.6.2 There shall be no obstruction by railings, barriers, or gates that divide the open space into sections appurtenant to individual rooms, apartments, or other uses. 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 they be fastened 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:**5-1.9.2.2)

3-1.6.3 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 exit. (**101:**5-1.9.2.3)

3-1.6.4 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 Electrical Fire Safety.

3-2.1 This section shall apply to new, existing, permanent, or temporary electrical appliances, fixtures, or wiring.

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

3-2.2 All electrical appliances, fixtures, or wiring shall be maintained in accordance with NFPA 70, *National Electrical Code®.*

3-2.3 Permanent wiring shall be installed and maintained in accordance with NFPA 70.

3-2.4 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.

3-2.5 Where no applicable standards or requirements are set out in this section, compliance with NFPA 70 shall be deemed as evidence of compliance with the intent of this section.

3-3 Smoking.

3-3.1 Special Definition.

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

3-3.2 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.

3-3.3 In areas where smoking is permitted, noncombustible ash trays shall be provided.

3-3.4 Removal or destruction of any required "No Smoking" sign shall be prohibited.

3-3.5 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, Outdoor Fireplaces.

3-4.1 See Section 1-15 for permit required.

Exception: Cooking fires.

3-4.2 Permitted open fires shall be located not less than 50 ft (15.3 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. Nothing in this section shall apply to the area within the boundaries of an approved smoking area required by this Code as designated by the authority having jurisdiction.

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 (3.1 m) of combustible patios on ground floors.

Exception: Single-family dwellings.

3-4.8 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 (45.75 m) from a public road or exceed 30 ft (9.14 m) in height and are set back over 50 ft (15.25 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 (6.1 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 (45.8 m) in length. The turnaround shall have a minimum centerline radius of 50 ft (15.3 m). The grade of the fire lane shall be within the limits established 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.

3-6 Key Boxes. The authority having jurisdiction shall have the authority to require a key box to be installed in an accessible location where access to or within a structure or area is difficult because of security. The key box shall be a type approved by the authority having jurisdiction and shall contain keys 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 key(s), any time a lock is changed or rekeyed and a key(s) to that lock is contained in the key 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 so placed 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. 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:**5-2.2.5.4)

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: Where signs required by 5-2.2.5.4 of NFPA 101 are provided.

*Exception No. 2: Stairs that extend not more than 1 story below the level of exit discharge where the exit discharge is clearly obvious. (**101:**5-2.2.5.5)*

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. (25 mm) 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. (25 mm) high bold block lettering.

3-7.3.7 The floor level number shall be placed in the middle of the sign in minimum 5 in. (127 mm) 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. (25 mm) 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 section 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 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 Historical Buildings. The provisions of this Code relating to the construction, repair, alteration, enlargement, restoration, and moving of buildings or structures shall not be man-

datory 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.

3-10 Commercial Cooking Equipment.

3-10.1 Cooking equipment used in processes producing smoke or grease-laden vapors shall be equipped with an exhaust system complying with all the equipment and performance requirements of NFPA 96, *Fire Protection of Commercial Cooking Operations,* and with the following:

(a) A hood complying with the requirements of Chapter 2 of NFPA 96, and

(b) Grease removal devices complying with the requirements of Chapter 3 of NFPA 96, and

(c) A duct system complying with the requirements of Chapter 4 of NFPA 96, and

(d) Fire extinguishing equipment complying with the requirements of Chapter 7 of NFPA 96. (**96**:1-3.1)

3-10.2 Clearance.

3-10.2.1 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. to noncombustible material.

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 if the combustible material is protected as follows:

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 noncombustible materials, or materials and products that are listed for the purpose of reducing clearance and 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)

Type of Protection	*Clearance to Combustible Material*
(a) 0.013-in. (0.33-mm) (28-gauge) sheet metal spaced out 1 in. (25.4 mm) on noncombustible spacers.	*9 in. (228.6 mm)*
(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.	*3 in. (76.2 mm)*

3-10.2.2 The protection methods for ducts to reduce clearance are to be applied to the combustible or limited-combustible construction and not to the duct itself unless the listed materials and products are directly applied to the duct in accordance with the conditions of listing and the manufacturer's instructions. Materials or products directly applied to ducts shall demonstrate they provide sufficient mechanical and structural integrity, resiliency, and stability when subjected to expected building environmental conditions, duct movement under general operating conditions, and duct movement due to fire conditions. 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, it 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 the enclosure around or directly applied to the duct 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:**1-3.2.2)

3-10.2.3 A duct shall be permitted to contact noncombustible floors, interior walls, and other noncombustible structures or supports, but it shall not be in contact for more than 50 percent of its surface area per each lineal foot of contact length. Where such direct contact is made, the duct shall be protected from corrosion due to this contact.

Exception: When the duct is protected with a material or product listed for the purpose of reducing clearance to zero. (**96**:1-3.2.3)

3-10.2.4 For clearances between the duct and interior surfaces of enclosures, see 4-7.2.3 of NFPA 96. (**96:**1-3.2.4)

3-10.3 Cleaning.

3-10.3.1* 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 system shall be inspected at least every six months. (**96:**8-3.1)

3-10.3.1.1 When a vent cleaning service is used, a certificate showing date of inspection or cleaning shall be maintained on the premises. Areas not cleaned shall be noted. (**96:**8-3.1.1)

3-10.3.2 Flammable solvents or other flammable cleaning aids shall not be used. (**96:**8-3.2)

3-10.3.3 At the start of the cleaning process, electrical switches that could be accidentally activated shall be locked out. (**96:**8-3.3)

3-10.3.4 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. (**96**:8-3.4)

3-10.3.5 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)

3-10.3.6 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)

3-10.4 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)

3-10.5 Food preparation facilities protected in accordance with Section 6-3 are not required to have openings protected between food preparation areas and dining areas. Where domestic cooking equipment is used for food warming or lim-

ited cooking, protection or segregation of food preparation facilities is not required.

3-11 Combustible Waste and Refuse.

3-11.1 No person owning or having control of any property shall allow any combustible waste material to accumulate in any area or in any manner to create a fire hazard to life or property.

3-11.2 Combustible waste or refuse shall be properly stored or disposed of to prevent unsafe conditions.

3-11.3 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.

3-11.4 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.

3-11.5 Vehicles or conveyances used to transport combustible waste or refuse over public thoroughfares shall have all cargo space covered and maintained sufficiently 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.

3-12 Tar Kettles.

3-12.1 General.

3-12.1.1 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.

3-12.1.2 See Section 1-15 for permits required.

3-12.1.3 Operating kettles shall not be located inside of, or on the roof of, any building.

3-12.1.4 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.

3-12.1.5 An operating kettle shall be attended by a minimum of one employee knowledgeable of the operations and hazards. The employee shall be within 25 ft (7.6 m) of the kettle and have the kettle within sight.

3-12.1.6 Two approved, 20:BC 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.

3-12.1.7 Roofing kettles shall not block exits, means of egress, gates, roadways, or entrances. And in no case shall kettles be closer than 10 ft (3.1 m) from exits or means of egress.

3-12.2 Fuel System.

3-12.2.1 Fuel containers shall be constructed and approved for the use for which they were designed.

3-12.2.2 LPG containers, hose, regulators, and burners shall conform to the specifications in NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases.*

3-12.2.3 LPG cylinders shall be secured to prevent accidental tipover.

3-12.2.4 LPG cylinders, hose, regulators, and burners shall conform to the requirements found elsewhere in this Code.

3-12.2.5 Regulators shall be required on any cylinders.

3-12.2.6 Where, in the opinion of the authority having jurisdiction, there is danger of physical damage to the container, adequate protection shall be provided.

3-12.2.7 LPG containers for roofing kettles shall not be used in any building.

3-12.3 Maintenance.

3-12.3.1 Roofing kettles and all integral working parts shall be in good working condition and shall be maintained free of excessive residue.

3-12.3.2 All piping used for pumping heated material to the roof shall be installed in a manner to prevent loss of heated material.

3-12.3.3 Flexible steel piping shall not be used on the vertical extension of piping systems.

3-12.3.4 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.

3-12.3.5 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.

3-12.3.6 All kettles shall have an approved working visible temperature gauge that indicates the temperature of the material being heated.

3-12.3.7 All kettle doors shall be tightly closed and latched when in transit.

3-12.4 Construction. The materials and methods of construction of roofing kettles shall be acceptable to the authority having jurisdiction. The following are minimum requirements:

(a) This section shall apply to all roofing kettles or tar pots in excess of 1-gal (3.785-L) capacity.

(b) No roofing kettle shall have a capacity in excess of five barrels.

(c) 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), and 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 provided with a system of shields or insulation to prevent heat damage to the street surface.

(d) 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), close fitting, and attached to the kettle with hinges in a manner allowing for gravity closing of the lid.

(e) The chassis shall be substantially constructed and capable of carrying the load imposed upon it whether standing still or being transported.

(f) 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.

(g) Fuel containers that operate under air pressure shall not exceed 20 gal (75.7 L) in capacity and shall be subject to the approval of the authority having jurisdiction.

(h) All fuel containers shall be maintained in accordance with the applicable NFPA codes and standards or at least 10 ft (3.05 m) from the burner flame or at least 2 ft (0.61 m) therefrom when properly insulated from heat or flame.

3-13 Christmas Trees.

3-13.1 Natural cut Christmas trees shall not be permitted in assembly, educational, health care, residential board and care, detention and correctional, mercantile, hotel, or dormitory occupancies.

Exception No. 1: 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. 2: Trees located in areas protected by an approved automatic sprinkler system.

3-13.2 Artificial Christmas trees shall be labeled or otherwise identified or certified by the manufacturer as being "flame retardant" or "flame resistive."

3-13.3 No Christmas trees shall be allowed to obstruct corridors, exit ways, or other means of egress.

3-13.4 Only listed electrical lights and wiring shall be used on Christmas trees and similar decorations.

3-13.5 Electrical lights shall be prohibited on metal artificial trees.

3-13.6 Open flames such as from candles, lanterns, kerosene heaters, and gas-fired heaters shall not be located on or near Christmas trees or other similar combustible materials.

3-13.7 Natural cut Christmas trees shall not be located near heating vents or other fixed or portable heating devices that could cause the tree to dry out prematurely or to be ignited.

3-13.8 In occupancies where natural trees are permitted, the bottom end of the trunk shall be cut off at an angle at least 1 in. to 2 in. (25 mm to 51 mm) above the end to help the tree absorb water. The tree shall be placed in a suitable stand with adequate water. The water level shall be checked and maintained on a daily basis. The tree shall be removed from the building immediately upon evidence of dryness.

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 5-1.3.2 of NFPA *101.* All other inside stairs shall be protected in accordance with 6-2.4 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 required only to be enclosed on the story of exit discharge and at least 50 percent of the number and capacity of exits on the story of exit discharge shall be independent of such enclosures. (**101:**5-1.3.2.3)

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. (**101:**5-1.3.2.3)

4-1.2.1* 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 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. (**101:**5-1.3.2.3)

4-1.3* Interior Finish in Exits. The flame spread rating of interior finish on walls and ceilings shall be in accordance with NFPA *101.*

4-1.4 Doors.

4-1.4.1 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.

Exception No. 1: As provided in 4-1.7.1.

Exception No. 2: As provided in Chapters 12, 13, 14, and 15 of NFPA 101. (**101:**5-1.8.2)

4-1.4.2 Every door and every principal entrance that is required to serve as an exit shall be designed and constructed so that the way 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:**5-2.1.1.2)

4-1.5 Swing and Force to Open.

4-1.5.1* 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 use of the opening in which it is installed.

Exception No. 1: Sliding doors as provided in Chapters 14 and 15, and doors as provided in Chapter 21 of NFPA 101.

Exception No. 2: Where permitted in Chapters 8 through 31 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:

(a) They remain secured in the full open position during the period of occupancy by the general public; and

(b) On or adjacent to the door, there is a readily visible, durable sign in letters at least 1 in. (2.5 cm) high on a contrasting background that reads:

"THIS DOOR TO REMAIN OPEN WHEN THE BUILDING IS OCCUPIED" and

(c) Doors or grilles are not brought to the closed position when the space is occupied; and

(d) Doors or grilles are operable from within the space without the use of any special knowledge or effort; and

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

Exception No. 3: Horizontal sliding doors complying with 5-2.1.14 of NFPA 101.

Exception No. 4: Doors to private garages, industrial and storage areas with an occupant load of not more than 10, when such areas contain low or ordinary hazard contents.

Exception No. 5: Revolving doors complying with 5-2.1.10 of NFPA 101.

Exception No. 6: Existing fusible link-operated horizontal sliding or vertical rolling fire doors where permitted in Chapters 8 through 31 of NFPA 101. (**101:**5-1.3.2.3)

4-1.5.2 Doors required to be 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 5-2.4.3.6 of NFPA 101.

Exception No. 2: Smoke barrier doors as provided in Chapter 13 of NFPA 101. (**101:**5-2.1.4.2)

4-1.5.3 Doors shall swing in the direction of egress travel where used in an exit enclosure or where serving a high hazard contents area.

Exception: Doors from individual living units that open directly into an exit enclosure. (**101:**5-2.1.4.3)

4-1.5.4* During its swing, any door in a means of egress shall not obstruct more than one half of the required width of an aisle, corridor, passageway, or landing, nor 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 immediately onto a stair without a landing. The landing shall have a width at least equal to the width of the door. (*See 5-2.1.3 of NFPA 101.*)

Exception: In existing buildings, a door providing access to a stair shall maintain an unobstructed width of a stair or landing of at least 22 in. (55.9 cm) and, when open, project not more than 7 in. (17.8 cm) into the required width of a stair or landing. (**101:**5-2.1.4.4)

4-1.5.5 The forces required to fully open any door manually in a means of egress shall not be more than 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 be more than 5 lbf (22 N). These forces shall be applied at the latch stile.

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

Exception No. 2: Horizontal sliding doors as provided in Chapters 14 and 15 of NFPA 101.

Exception No. 3: Power-operated doors as provided in 5-2.1.9 of NFPA 101. (**101:**5-2.1.4.5)

4-1.5.6 Screen doors and storm doors used in a means of egress shall not swing against the direction of egress travel where doors are required to swing in the direction of egress travel. (**101:**5-2.1.4.6)

4-1.6 Locks, Latches, and Alarm Devices.

4-1.6.1 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 inside of the building.

Exception No. 1: As provided in Chapters 12, 13, 14, and 15 of NFPA 101.

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

(a) This exception is permitted in Chapters 8 through 31 of NFPA 101 for the specific occupancy

(b) On or adjacent to the door, there is a readily visible, durable sign in letters at least 1 in. (2.5 cm) high on a contrasting background that reads "THIS DOOR TO REMAIN OPEN 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

This exception shall be permitted to be revoked by the authority having jurisdiction for cause.

Exception No. 3: Where permitted in Chapters 8 through 31 of NFPA 101, key operation shall be permitted, provided the key cannot be removed when the door is locked from the side from which egress is to be made. (**101:**5-2.1.5.1)

4-1.6.2* Every stair enclosure door shall permit reentry from the stair enclosure to the interior of the building, or an automatic release shall be provided to unlock all stair enclosure doors to permit reentry. Such automatic release shall be actuated with the initiation of the building fire alarm system.

Exception No. 1: Selected doors on stair enclosures shall be permitted to be equipped with hardware that prevents reentry into the interior of the building provided:

(a) There are at least two levels where it is possible to leave the stair enclosure

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

(c) Reentry is possible on the top or next to top story permitting access to another exit

(d) Doors permitting reentry are identified as such on the stair side of the door

(e) Doors not permitting reentry shall be provided with a sign on the stair side indicating the location of the nearest door, in each direction of travel, permitting reentry or exit.

Exception No. 2: Stairs serving not more than four stories.

Exception No. 3: Existing installations as permitted in Chapters 8 through 31 of NFPA 101.

Exception No. 4: Stair enclosures serving a building permitted to have a single exit in accordance with Chapters 8 through 32 of NFPA 101.

Exception No. 5: As provided in Chapters 12 and 14 of NFPA 101. (**101:**5-2.1.5.2)

4-1.6.3* A latch or other fastening device on a door shall be provided with a releasing device having an obvious method of operation under all lighting conditions. The releasing mechanism for any latch shall be located not more than 48 in. (122 cm) above the finished floor. Doors shall be openable with not more than one releasing operation.

*Exception: *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 such device is operable from the inside without the use of a key or tool and is mounted at a height not more than 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) in height above the finished floor. Automatic latching devices shall not be located more than 48 in. (122 cm) above the finished floor.* **(101:**5-2.1.5.3)

4-1.6.4 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 upon 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 having 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:**5-2.1.5.4)

4-1.6.5* Devices shall not be installed in connection with any door on which panic hardware or fire exit hardware is required, provided such device prevents or is intended to prevent the free use of the door for purposes of egress.

Exception: As otherwise provided in 4-1.7.1. **(101:**5-2.1.5.5)

4-1.7 Special Locking Arrangements.

4-1.7.1 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 installed in accordance with Section 7-6 of NFPA *101*, or an approved, supervised automatic sprinkler system installed in accordance with Section 7-7 of NFPA *101*, and where permitted in Chapters 8 through 31 of NFPA *101*, provided:

(a) The doors unlock upon actuation of an approved, supervised automatic sprinkler system installed in accordance with Section 7-7 of NFPA *101*, or upon the actuation of any heat detector or not more than two smoke detectors of an approved, supervised automatic fire detection system installed in accordance with Section 7-6 of NFPA *101*, and

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

(c) The doors unlock upon disablement of the automatic fire detection system, sprinkler system, or the means of sprinkler system supervision protecting the building area served by the door(s), and

(d) An irreversible process releases the lock within 15 seconds upon application to the release device required in 4-1.6.3 of a force that shall not be required to exceed 15 lbf (67 N) nor requiring to be continuously applied for more than 3 seconds. The initiation of the release process shall activate a signal in the vicinity of the door to ensure those attempting to egress that the system is functional. Once the door lock has been released by the application of force to the releasing device, relocking shall be by manual means only, and

Exception to (d): Where approved by the authority having jurisdiction, a delay of not more than 30 seconds shall be permitted provided that reasonable life safety is ensured.

(e) *On the door adjacent to the release device, there is a readily visible, durable sign in letters at least 1 in. (2.5 cm) high and at least $^1/_8$ in. (0.3 cm) in stroke width on a contrasting background that reads:

"PUSH UNTIL ALARM SOUNDS.
DOOR CAN BE OPENED IN 15 SECONDS"
(**101:**5-2.1.6.1)

4-1.7.2 Access-Controlled Egress Doors. Where permitted in Chapters 8 through 32 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:

(a) A sensor is provided on the egress side arranged to detect an occupant approaching the doors and the doors are arranged to unlock upon detection of approaching occupant or loss of power to the sensor, and

(b) Loss of power to that part of the access control system that locks the doors automatically unlocks the doors, and

(c) The doors are arranged to unlock from a manual release device located 40 in. (102 cm) to 48 in. (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: "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 at least 30 seconds, and

(d) Activation of the building fire-protective signaling system, if provided, automatically unlocks the doors, and the doors remain unlocked until the fire-protective signaling system has been manually reset, and

(e) Activation of the building automatic sprinkler or fire detection system, if provided, automatically unlocks the doors and the doors remain unlocked until the fire-protective signaling system has been manually reset. (**101:**5-2.1.6.2)

4-1.8 Signs.

4-1.8.1 Stair Identification Signs. 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. 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:**5-2.2.5.4)

4-1.8.2 Egress Direction Signs. 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: Where signs required by 4-1.8.1 are provided.

Exception No. 2: Stairs that extend not more than 1 story below the level of exit discharge where the exit discharge is clearly obvious. **(101:**5-2.2.5.5)

4-1.9* Self-Closing Devices. A door designed to normally be kept closed in a means of egress shall be a self-closing door and shall not be secured in the open position at any time.

Exception: In any building of low or ordinary hazard contents, as defined in Chapter 2, or where approved by the authority having jurisdiction, doors shall be permitted to be automatic-closing provided:

(a) Upon release of the hold-open mechanism, the door becomes self-closing; and

(b) The release device is designed so that the door instantly releases manually and upon release becomes self-closing, or the door closes by some simple or readily obvious operation; and

(c) The automatic releasing mechanism or medium is activated by (1) the operation of an approved, automatic smoke detection system installed in accordance with Section 7-6 of NFPA 101 to protect the entire building, designed and installed to provide for actuation of the system promptly so as to preclude the generation of heat or smoke sufficient to interfere with egress before the system operates, or (2) the operation of approved smoke detectors installed in such a way as to detect smoke on either side of the door opening, as detailed in NFPA 72, National Fire Alarm Code. The above systems shall be permitted to be zoned where approved by the authority having jurisdiction; and

(d) Any fire detection system or smoke detector is provided with such supervision and safeguards as are necessary to ensure reliability of operation in case of fire (see also Section 7-6 of NFPA 101); and

(e) Upon loss of power to the hold-open device, the hold-open mechanism is released and the door becomes self-closing; and

(f) The release by means of smoke detection of one door in a stair enclosure results in closing all doors serving that stair. **(101:**5-2.1.8)

4-2 Minimum Width.

4-2.1 The minimum width of any means of egress shall be that required for a given egress component in Chapter 5 of NFPA *101* or Chapters 8 through 31 of NFPA *101*, and shall be at least 36 in. (91 cm).

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

Exception No. 2: Doors as provided for in 4-1.5.3.

Exception No. 3: In existing buildings, the minimum width shall be at least 28 in. (71 cm).

Exception No. 4: Aisles and aisle accessways as provided in Chapters 8 and 9 of NFPA 101.

Exception No. 5: Industrial equipment access as provided in Chapter 28 of NFPA 101. **(101:**5-3.4.1)

4-2.2 Where a single exit access leads to an exit, its capacity in terms of width shall be at least equal to 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:**5-3.4.2)

4-3 Number of Means of Egress.

4-3.1 The minimum number of means of egress from any balcony, mezzanine, story, or portion thereof shall be two.

Exception No. 1: Where a single means of egress is permitted in Chapters 8 through 32 of NFPA 101.

Exception No. 2: A mezzanine or balcony shall be permitted to have a single means of egress provided the common path of travel limitations of Chapters 8 through 31 of NFPA 101 are met. **(101:**5-4.1.1)

4-3.2 The minimum number of separate means of egress from any story or portion thereof shall be as follows:

Occupant load more than 500 but not more than 1,000 — 3
Occupant load more than 1,000 — 4

Exception: Existing buildings as permitted in Chapters 8 through 31 of NFPA 101. **(101:**5-4.1.2)

4-3.3 Accessible means of egress, in accordance with 5-5.4 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:**5-4.1.3)

4-3.4 Only the occupant load of each story considered individually shall be required to be used in computing the number of means of egress at that story, provided that the required number of means of egress shall not be decreased in the direction of egress travel. (**101:**5-4.1.4)

4-3.5 Doors other than the hoistway door and the elevator car door shall be prohibited at the point of access to an elevator car.

Exception: Doors that are readily openable from the car side without a key, tool, special knowledge, or special effort. **(101:**5-4.1.5)

4-3.6 Elevator lobbies shall have access to at least one exit. Such exit access shall not require the use of a key, a tool, or special knowledge or special effort. (**101:**5-4.1.6)

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:**5-5.1.1)

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

Exception No. 1: Where a single exit is permitted in Chapters 8 through 31 of NFPA 101.

Exception No. 2: Where common paths of travel are permitted for an occupancy in Chapters 8 through 31 of NFPA 101, such common paths of travel shall be permitted but shall not be more than 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:

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

(b) The path of travel is marked in accordance with Section 5-10, of NFPA 101; and

(c) Doors to such rooms comply with 5-2.1 of NFPA 101; and

(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:**5-5.1.2)

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:**5-5.1.3)

4-4.4* Exit access shall be arranged so that there are no dead ends in corridors. (*See Table A-4-4.2.*)

Exception: Where dead ends are permitted in Chapters 8 through 31 of NFPA 101, such dead ends shall be permitted but shall not be more than the limit specified. **(101:**5-5.1.6)

4-4.5 Exit access from rooms or spaces shall be permitted to be through adjoining or intervening rooms or areas, provided 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 shall not be necessary to pass through any area identified under Protection from Hazards in Chapters 8 through 32 of NFPA *101*. (**101:**5-5.1.7)

4-5 Illumination of Means of Egress.

4-5.1* Illumination of means of egress shall be provided in accordance with this section for every building and structure where required in Chapters 8 through 32 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:**5-8.1.1)

4-5.2 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 places 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 switch controllers are equipped for fail-safe operation, illumination timers are set for a minimum 15 min duration, and the motion sensor is activated by any occupant movement in the area served by the lighting units. **(101:**5-8.1.2)

4-6* Emergency Lighting. Emergency lighting facilities for means of egress shall be provided in accordance with this section for:

(a) Every building or structure where required in Chapters 8 through 32 of NFPA *101*, and

(b) At doors equipped with delayed egress locks, and

(c) The stair shaft and vestibule of smokeproof enclosures. A standby generator that is installed for the smokeproof enclosure mechanical ventilation equipment shall be permitted to be used for such stair shaft and vestibule 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:**5-9.1.1)

4-7 Marking of Means of Egress.

4-7.1* Exits shall be marked by an approved sign readily visible from any direction of exit access.

Exception: Main exterior exit doors that obviously and clearly are identifiable as exits. **(101:**5-10.1.2)

4-7.2 Access to exits shall be marked by approved, readily visible signs in all cases where the exit or way to reach it is not readily apparent to the occupants. Sign placement shall be such that no point in the exit access corridor is more than 100 ft (30 m) from the nearest sign.

Exception: Signs in exit access corridors in existing buildings shall not be required to meet the 100-ft (30-m) distance requirement. **(101:**5-10.1.4)

4-7.3* Every sign required in Section 5-10 of NFPA *101* shall be located and of such size, distinctive color, and design as to be readily visible and shall provide contrast with decorations, interior finish, or other signs. No decorations, furnishings, or equipment that impairs visibility of an exit sign shall be permitted, nor shall there be any brightly illuminated sign (for other than exit purposes), display, or object in or near the line of vision of the required exit sign of such a character as to detract attention from the exit sign. (**101:**5-10.1.6)

4-7.4* Size of Signs.

4-7.4.1 Externally illuminated signs required by 5-10.1 and 5-10.4.1.1 of NFPA *101* 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 $^3/_4$ 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 $^3/_8$ 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: Approved existing signs.

Exception No. 2: Existing signs having the required wording in plainly legible letters not less than 4 in. (10.2 cm) high.

Exception No. 3: Marking required by 5-10.1.3 and 5-10.1.7 of NFPA 101. **(101:**5-10.2.1)

4-7.4.2* Internally illuminated signs required by 5-10.1 and 5-10.4.1.1 of NFPA *101* shall have the word "EXIT" or other appropriate wording in letters legible from a distance of at least 100 ft (30 m) under all normal and emergency lighting conditions (30 ft-candle and 1 ft-candle, respectively). Internally illuminated signs shall be listed in accordance with UL 924, *Standard for Safety Emergency Lighting and Power Equipment.*

Exception No. 1: Approved existing signs.

Exception No. 2: Existing signs having the required wording in plainly legible letters not less than 4 in. (10.2 cm) high.

*Exception No. 3: Marking required by 5-10.1.3 and 5-10.1.7 of NFPA 101.***(101:**5-10.2.2)

4-7.5* Illumination of Signs.

4-7.5.1* Every sign required by 4-7.1or 4-7.2 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:**5-10.3.1)

4-7.5.2* Every sign required to be illuminated by 5-10.3 of NFPA *101* shall be continuously illuminated as required under the provisions of Section 5-8 of NFPA *101*.

*Exception: *Illumination for signs shall be permitted to flash on and off upon activation of the fire alarm system.* **(101:**5-10.3.4)

4-7.5.3 Where emergency lighting facilities are required by the applicable provisions of Chapters 8 through 32 of NFPA *101* for individual occupancies, the exit signs shall be illuminated by the emergency lighting facilities. The level of illumination of the exit sign shall be at the levels provided in accordance with 5-10.3.2 or 5-10.3.3 of NFPA *101* for the required emergency lighting time duration as specified in 5-9.2.1 of NFPA *101*, but shall be permitted to decline to 60 percent of the illumination level at the end of the emergency lighting time duration.

Exception: Approved self-luminous signs. **(101:**5-10.3.5)

4-7.6 Specific Requirements.

4-7.6.1 Directional Signs.

4-7.6.1.1* A sign complying with 4-7.4 reading "EXIT" or a similar designation 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. Directional signs shall be listed. (**101:**5-10.4.1.1)

4-7.6.1.2* Directional Indicator. The directional indicator shall be located outside of the EXIT legend, not less than $^3/_8$ in. (1 cm) from any letter, and shall be permitted to be integral to or separate from the sign body. The directional indicator shall be of a chevron type as shown in Figure 4-7.6.1.2 and shall be identifiable as a directional indicator at a minimum distance of 40 ft (12.2 m) at 30 ft-candle and 1 ft-candle average illumination on the floor representing normal and emergency lighting levels respectively. The directional indicators shall be located at the end of the sign for the direction indicated.

Exception: Approved existing signs. (**101:**5-10.4.1.2)

Figure 4-7.6.1.2 Chevron-type indicator.

4-7.6.2* 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 reading "NO EXIT". Such sign shall have the word "NO" in letters 2 in. (5 cm) high with stroke width of $^3/_8$ in. (1 cm) and the word "EXIT" in letters 1 in. (2.5 cm) high, with the word "EXIT" below the word "NO."

Exception: Approved existing signs. (**101:**5-10.4.2)

4-8 Means of Egress Reliability.

4-8.1* 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:**5-1.9.1)

4-8.2 Furnishings and Decorations in Means of Egress.

4-8.2.1 No furnishings, decorations, or other objects shall be placed to obstruct exits, access thereto, egress therefrom, or visibility thereof. (**101:**5-1.9.2.1)

4-8.2.2 There shall be no obstructions by railings, barriers, or gates that divide the open space into sections appurtenant to individual rooms, apartments, or other uses. 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 they be fastened 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:**5-1.9.2.2)

Chapter 5 Fire Safety Construction Features

5-1 General Requirements. Fire safety construction features for new and existing occupancies shall comply with this Code and the referenced edition of NFPA *101*, *Life Safety Code*.

Chapter 6 Fire Protection Systems and Equipment

6-1 General Requirements.

6-1.1 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 1-17. 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.

6-1.2 The property owner shall be responsible for the proper testing and maintenance of the equipment and systems.

6-1.3 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.

6-2 Standpipe Systems.

6-2.1 General. The design and installation of standpipe systems shall be in accordance with this section and NFPA 14, *Standard for the Installation of Standpipe and Hose Systems.*

6-2.2 Requirements. New buildings more than three stories in height or new buildings over 50 ft (15.25 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.

6-2.3 Inspection, Testing, and Maintenance.

6-2.3.1 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.

6-2.3.2 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.*

6-2.3.3 Where an existing standpipe system, including yard piping and fire department connection, is modified, the new piping shall be tested in accordance with 8-4.1 of NFPA 14. (**14:**8-4.3)

6-3 Extinguishing Systems for Commercial Cooking Equipment.

6-3.1 General.

6-3.1.1 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.

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

6-3.1.2 Prior to installation, shop drawings shall be reviewed and approved by the authority having jurisdiction. (*See Section 1-15 for permits required.*)

6-3.2 Where Required.

6-3.2.1 Approved fire extinguishing equipment shall be provided for the protection of grease removal devices, hoods, and duct systems.

Exception No. 1: If acceptable to the authority having jurisdiction, the portion of the fire extinguishing system for the protection of grease removal devices and hoods shall be permitted to be omitted where all cooking equipment is served by a listed exhaust hood containing a constant or fire-actuated water system and where such water system is listed to extinguish a fire in grease removal devices and hoods and does not adversely affect the operation of the fire extinguishing system for the duct and cooking equipment.

Exception No. 2: If acceptable to the authority having jurisdiction, the portion of the fire extinguishing system for the protection of the duct system shall be permitted to be omitted where all the cooking equipment is served by a listed exhaust hood, with or without damper, with constant or fire-actuated water system and where such water system is listed to extinguish a fire in the duct system. (**96:**7-1.1)

6-3.2.1.1 If a listed exhaust hood with a constant or fire-actuated water fire system is used, the water shall be permitted to be supplied from the kitchen cold or hot water supply, provided the required pressure and flow are available. All valves between the supply and the hood shall be supervised. The closing of a supervised valve or pressure switch shall automatically shut off all sources of fuel and heat to all equipment serviced by that hood. The system shall meet all the operating requirements of 6-3.4.1.3. (**96:**7-1.1.1)

6-3.2.2 Cooking equipment (such as deep fat fryers, ranges, griddles, and broilers) that might be a source of ignition of grease in the hood, grease removal device, or duct shall be protected by approved extinguishing equipment. (**96:**7-1.2)

6-3.3 Types of Equipment.

6-3.3.1 Fire extinguishing equipment shall include both fixed automatic fire extinguishing systems and portable fire extinguishers. (**96:**7-2.1)

6-3.3.2 Fixed automatic fire extinguishing systems as required by 6-3.3.1 shall be either:

(a) Automatic fire extinguishing systems specifically listed for the hazard and installed in accordance with the terms of their listing, the manufacturer's instructions, and NFPA 17, *Standard for Dry Chemical Extinguishing Systems,* or NFPA 17A, *Standard for Wet Chemical Extinguishing Systems,* or

(b) Other automatic fire extinguishing systems installed in compliance with the provisions of the following standards, where applicable:

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*

NFPA 13, *Standard for the Installation of Sprinkler Systems*

NFPA 16, *Standard for the Installation of Deluge Foam-Water Sprinkler and Foam-Water Spray Systems*

NFPA 17, *Standard for Dry Chemical Extinguishing Systems* (**96:**7-2.2)

6-3.4 Operating Requirements.

6-3.4.1 Fixed pipe extinguishing equipment shall be installed to conform with the requirements of 6-3.4.1.1 through 6-3.4.1.4. (**96:**7-3.1)

6-3.4.1.1 A readily accessible means for manual activation of the fire extinguishing system shall be provided in a path of exit or egress and shall be clearly identified. Such means shall be mechanical and shall not rely on electrical power for actuation.

Exception No. 1: A sprinkler system shall not require manual activation.

Exception No. 2: Electrical power shall be permitted to be used for manual activation of the system if a reserve power supply is provided. (**96:**7-3.1.1)

6-3.4.1.2 Fixed pipe extinguishing systems in a 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:**7-3.1.2)

6-3.4.1.3 The operation of any extinguishing system shall automatically shut off all sources of fuel and heat to all equipment requiring protection by that extinguishing system. Any gas appliance not requiring protection but located under the same ventilating equipment shall also be shut off. All shutdown devices shall be considered integral parts of the system and shall function with the system operation. This equipment shall be of the type that requires manual resetting prior to fuel or power restoration.

Exception: Steam supplied from an external source. (**96:**7-3.1.3)

6-3.4.1.3.1 All electrical sources located under the ventilating equipment, if subject to exposure to discharge from the fire extinguishing system, shall be shut off upon operation of a wet chemical or water fire extinguishing system. (**96:**7-3.1.3.1)

6-3.4.1.4 The operation of any extinguishing system applicable to this standard shall automatically signal any fire alarm signaling system serving the occupancy wherein the extinguishing system is located, where such alarm system is present. Where electrical power is required to operate the extinguishing system, it shall be monitored by a supervisory alarm. (**96:**7-3.1.4)

6-3.4.2 Portable Fire Extinguishers.

6-3.4.2.1 Portable fire extinguishers required by 6-3.3.1 shall be installed in kitchen cooking areas in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*, Table 3-3.1 for Extra (high) Hazard.

NOTE: Class B gas-type portables such as CO_2 and halon shall not be used in kitchen cooking areas. 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 suitable for this application. Extinguishers containing sodium bicarbonate or potassium bicarbonate dry chemical and potassium carbonate solutions are considered suitable; others might not be suitable due to agent characteristics. Manufacturer's recommendations should be followed. (**96:**7-5.1)

6-3.4.2.2 Other fire extinguishers in the kitchen area shall be installed in accordance with NFPA 10, *Standard for Portable Fire Extinguishers.* (**96:**7-5.2)

6-3.5 Operating Procedures.

6-3.5.1 Exhaust systems shall be operated during all periods of cooking. (**96:**8-1.1)

6-3.5.2 Filter-equipped exhaust systems shall not be operated with filters removed. (**96:**8-1.2)

6-3.5.3 Openings provided for replacing air exhausted through ventilating equipment shall not be restricted by covers, dampers, or any other means that would reduce the operating efficiency of the exhaust system. (**96:**8-1.3)

6-3.5.4 Instructions for manually operating the fire extinguishing system shall be posted conspicuously in the kitchen and shall be reviewed periodically with employees by the management. (**96:**8-1.4)

6-3.5.5 Listed exhaust hoods shall be operated in accordance with the terms of their listings and the manufacturer's instructions. (**96:**8-1.5)

6-3.5.6 Cooking equipment shall not be operated while its fire extinguishing system or exhaust system is nonoperational or otherwise impaired. (**96:**8-1.6)

6-3.6 Inspection, Testing, and Maintenance.

6-3.6.1 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:**8-2.1)

6-3.6.1.1 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:**8-2.1.1)

6-3.6.1.2 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:**8-2.1.2)

6-3.6.1.3 If required, certificates of inspection and maintenance shall be forwarded to the authority having jurisdiction. (**96:**8-2.1.3)

6-4 Fire Pumps.

6-4.1 General.

6-4.1.1 Where provided, fire pumps shall be installed in accordance with this section and NFPA 20, *Standard for the Installation of Centrifugal Fire Pumps.*

Exception: Where existing pump installations meet the provisions of the standard in effect at the time of purchase, they shall be permitted to remain in use provided they do not constitute a distinct hazard to life or adjoining property. (**20:**1-2.2)

6-4.1.2 See Section 1-15 for permits required.

6-4.1.3* 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)

6-4.1.4 The horizontal split-case pump in horizontal or vertical position, and end-suction and in-line pumps shall not be used where a static suction lift is involved. (**20:**3-1.2)

6-4.1.5 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 6-4.1.6 for higher temperature requirements for internal combustion engines. (**20:**3-1.2)

6-4.1.6 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)

Exception: Installations made prior to adoption of NFPA 20, 1996 edition are not required to have an engine jacket water heater.

6-4.1.7 Dual driver pump units shall not be used. (**20:**2-2.3)

Exception: Installations made prior to adoption of NFPA 20, 1974 edition.

6-4.1.8 When 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:

(a) Central station, proprietary, or remote station signaling service;

(b) Local signaling service that will cause the sounding of an audible signal at a constantly attended point;

(c) Locking valves open;

(d) 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 valves shall be supervised closed. (**20:**2-11)

6-4.2 Workspace.

6-4.2.1 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 electric equipment.

6-4.2.2 There shall be a minimum of 30 in. (76.2 cm) work space in front of the electric equipment requiring examination, adjustment, servicing, or maintenance.

6-4.2.3 Working space shall not be used for storage.

6-4.2.4 Illumination shall be provided for all working spaces around electric equipment requiring servicing, examination, or adjustment.

6-4.2.5 Provision shall be made for ventilation of a pump room or pump house. (**20:**2-7.5)

6-4.2.6 Floors shall be pitched for adequate drainage of escaping water away from critical equipment such as the pump, driver, controller, etc. 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)

6-4.3 Diesel Drive Pumps.

6-4.3.1 Engine Connection to Pump.

6-4.3.1.1 Horizontal Shaft Pumps. Engines shall be connected to horizontal shaft pumps by means of a flexible coupling or flexible connecting shaft listed for this service. The flexible coupling shall be directly attached to the engine flywheel adapter or stub shaft. (*See Section 3-5 of NFPA 20.*) (**20:**8-2.3.1)

6-4.3.1.2 Vertical Shaft Turbine-Type Pumps. Engines shall be connected to vertical shaft pumps by means of a right-angle gear drive with a listed flexible connecting shaft that will prevent undue strain on either the engine or gear drive. (*See Section 4-5 of NFPA 20.*)

Exception: Diesel engines and steam turbines designed and listed for vertical installation with vertical shaft turbine-type pumps shall be permitted to employ solid shafts and do not require a right-angle drive but do require a nonreverse ratchet. **(20:**8-2.3.2)

6-4.3.2 Batteries.

6-4.3.2.1 Each engine shall be provided with two storage battery units.

At 40°F (4.5°C), each battery unit shall have twice the capacity sufficient to maintain the cranking speed recommended by the engine manufacturer through a 3 minute "attempt to start" cycle (15 seconds of cranking and 15 seconds of rest, in six consecutive cycles). (**20:**8-2.5.2.1)

Exception: Installations made prior to adoption of NFPA 20, 1974 edition.

6-4.3.2.2 Storage batteries shall be rack-supported above the floor, secured against displacement, and located where they will not be subject to excessive temperature, vibration, mechanical injury, or flooding with water. They shall be readily accessible for servicing. Battery cables shall be sized in accordance with the engine manufacturer's recommendations considering the cable length required for the specific battery location. (**20:**8-2.5.2.5)

6-4.3.3 Fuel Supply and Arrangement.

6-4.3.3.1 Fuel supply tank(s) shall have a capacity at least equal to 1 gal per horsepower (5.07 L/kW), plus 5 percent volume for expansion and 5 percent volume for sump. Larger capacity tanks might be required and shall be determined by prevailing conditions, such as refill cycle and fuel heating due to recirculation, and shall be subject to special conditions in each case. The fuel supply tank and fuel shall be reserved exclusively for the fire pump diesel engine. (**20:**8-4.3)

6-4.3.3.2 There shall be a separate fuel line and separate fuel supply tank for each engine. (**20:**8-4.4)

6-4.3.3.3 Diesel fuel supply tanks shall be located aboveground in accordance with municipal or other ordinances and in accordance with the requirements of the authority having jurisdiction, and shall not be buried. The engine fuel supply (suction) connection shall be located on the tank so that 5 percent of the tank volume provides a sump volume not usable by the engine. The fuel supply shall be located on a side of the tank at the level of the 5 percent sump volume. The inlet of the fuel supply line shall be located so that its opening is no lower than the level of the engine fuel transfer pump. The engine manufacturer's fuel pump static head pressure limits shall not be exceeded when the level of fuel in the tank is at a maximum. The fuel return line shall be installed per the engine manufacturer's recommendation. In zones where freezing [32°F (0°C)] might be encountered, the fuel tanks shall be located in the pump room. Means other than sight tubes shall be provided for determining the amount of fuel in each storage tank. Each tank shall have suitable fill, drain, and vent connections. (**20:**8-4.5)

6-4.4 Controllers.

6-4.4.1 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)

6-4.4.2 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)

6-4.4.3 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 volts shall be provided at a point of constant attendance. These alarms shall indicate the following:

(a) Engine running (separate signal),

(b) The controller main switch has been turned to "off" or "manual" position (separate signal), and

(c) Trouble on the controller or engine (separate or common signals). (**20:**9-4.2)

6-4.5 Field Acceptance Tests.

6-4.5.1 The pump manufacturer, the engine manufacturer (when supplied), the controller manufacturer, and the transfer switch manufacturer (when supplied) (or their respective representative) shall be present for the field acceptance test. (**20:**11-2.1)

6-4.5.2 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 start-up and acceptance test. (**20:**11-2.1.1)

6-4.5.3 The authority having jurisdiction shall be notified as to time and place of the field acceptance test. (**20:**11-2.2)

6-4.5.4 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)

6-4.5.5 The fire pump shall perform at minimum, rated, and peak loads without objectionable overheating of any component. (**20:**11-2.4)

6-4.5.6 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)

6-4.5.7 Field acceptance tests shall be conducted in accordance with NFPA 20.

6-4.6 Inspection, Testing, and Maintenance.

6-4.6.1 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.

6-4.6.2 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.*

6-4.6.3 Annual Tests.

6-4.6.3.1 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 6-4.6.3.1(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.

NOTE: Care should 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 flow meter to drain or suction the reservoir; pump suction and discharge pressures and the flow meter measurements shall determine the total pump output.

(c) Use of the pump discharge via the bypass flow meter to pump suction (closed-loop metering); pump suction and discharge pressures and the flow meter measurements shall determine the total pump output.

Where the annual test is conducted periodically in accordance with 6-4.6.3.1(c), a test shall be conducted every three years in accordance with 6-4.6.3.1(a) or (b) in lieu of the method described in 6-4.6.3.1(c).

Where 6-4.6.3.1(b) or (c) is used, the flow meter 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, 6-4.6.3.1(a) shall be used. If testing in accordance with 6-4.6.3.1(a) is not possible, a flow meter calibration shall be performed and the test shall be repeated. (**25:**5-3.3.1)

6-4.6.3.2 The pertinent visual observations, measurements, and adjustments specified in Table 6-4.6.3.2 shall be conducted while the pump is running and flowing water under the specified output condition.

Table 6-4.6.3.2 Annual Test Procedure

At No-Flow Condition (Churn) (Conduct this test first)
Check circulation relief valve for operation to discharge water *(see 9-5.4 of NFPA 25)*
Check pressure relief valve (if installed) for proper operation *(see 9-5.4 of NFPA 25)*
Continue test for $^1/_2$ hour
At Each Flow Condition
Record electric motor voltage and current (all lines)
Record pump speed in rpm
Record simultaneous (approximately) readings of pump suction and discharge pressures and pump discharge flow
Observe operation of any alarm indicators or any visible abnormalities (*see 9-5.4.1.1 of NFPA 25*)

(**25**:5-3.3.2)

6-4.6.3.3 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)

6-4.6.3.4 For installations having an automatic transfer switch, the following test shall be performed to ensure that the overcurrent protective devices (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)

6-4.6.3.5 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)

6-4.6.4 Other Tests.

6-4.6.4.1 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)

6-4.6.4.2 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)

6-4.6.4.3 Tests of appropriate environmental pump room space conditions shall be made (e.g., heating, ventilation, illumination) to ensure proper manual or automatic operation of the associated equipment. (**25:**5-3.4.3)

6-4.6.5 Test Results and Evaluation.

6-4.6.5.1 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)

6-4.6.5.2 The pump test curve shall be compared to the unadjusted field acceptance test curve and the previous annual test curve(s). 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)

6-4.6.5.3 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 (nameplate) voltage shall be considered acceptable. (**25:**5-3.5.3)

6-4.6.5.4 The pump shall be capable of supplying the maximum system demand. (**25:**5-3.5.4)

6-4.7 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)

6-4.8 Operation and Maintenance for Diesel Drive Pumps.

6-4.8.1 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)

6-4.8.2 System Performance. Engines shall be kept clean, dry, and well lubricated to ensure adequate performance. [*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:**8-6.2)

6-4.8.3 Battery Maintenance.

6-4.8.3.1 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)

6-4.8.3.2 Only distilled water shall be used in battery cells. The plates shall be kept submerged at all times. (**20:**8-6.3.2)

6-4.8.3.3 The automatic feature of a battery charger is not 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)

6-4.8.4 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. They shall always be filled by means that will ensure removal of all water and foreign material. (**20:**8-6.4)

6-4.8.5 Fire Pump Maintenance. A preventive maintenance program shall be established on all components of the pump assembly in accordance with the pump 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 provides alternative requirements. (**25:**5-5.1)

6-5 Water Supply.

6-5.1 Private fire service mains shall be installed in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances.*

6-5.2 Where no piped water supply exists, the requirements of NFPA 1231, *Standard on Water Supplies for Suburban and Rural Fire Fighting*, shall apply.

6-5.3* The installation of devices to protect the public water supply from contamination shall comply with the provisions of NFPA 13, NFPA 24, and the plumbing code of the jurisdiction. Backflow prevention devices shall be inspected, tested, and maintained in accordance with the requirements of NFPA 25.

6-5.4 Inspection, Testing, and Maintenance.

6-5.4.1 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.

6-5.4.2 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.*

6-6 Portable Fire Extinguishers.

6-6.1 General Requirements.

6-6.1.1 Portable fire extinguishers used to comply with this standard 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:

(a) Fire Test Standards: ANSI/UL 711, CAN 4-S508-M83.

(b) Performance Standards:

1. Carbon Dioxide Types: ANSI/UL 154, CAN 4-S503-M83
2. Dry Chemical Types: ANSI/UL 299, ULC-S504
3. Water Types: ANSI/UL 626, CAN 4-S507-M83
4. Halon Types: ANSI/UL 1093, ULC-S512
5. Film Forming Foam Types: ANSI/UL 8. (**10:**1-4.3)

6-6.1.2 Special Definitions.

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

Class B Fires. Fires in flammable liquids, oils, greases, tars, oil-base paints, lacquers, and flammable gases. (**10:**1-3)

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

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

6-6.1.3* Classification of Hazards.

6-6.1.3.1 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 may include some buildings or rooms occupied as offices, classrooms, churches, assembly halls, guest room areas of hotels/motels, etc. 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, etc., are included provided that they are kept in closed containers and safely stored. (**10:**1-5.1)

6-6.1.3.2 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 sup-

port service areas of light (low) hazard occupancies, and warehouses containing Class I or Class II commodities as defined by NFPA 231, *Standard for General Storage.* (**10:**1-5.2)

6-6.1.3.3 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, and/or finished product, 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, coating, including flammable liquid handling. Also included is warehousing of or in-process storage of other than Class I and Class II commodities. (**10:**1-5.3)

6-6.1.4 Specific Requirements for All Extinguishers.

6-6.1.4.1 The classification of 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 B only) that indicates the relative extinguishing effectiveness.

Exception: Extinguishers classified for use on Class C or D hazards shall not be required to have a number preceding the classification letter.(**10:**1-6.1)

6-6.1.4.2 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)

6-6.1.4.3 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)

6-6.1.4.4 Cabinets housing fire extinguishers shall not be locked.

Exception: Where fire extinguishers are subject to malicious use, locked cabinets may be used provided they include means of emergency access. (**10:**1-6.5)

6-6.1.4.5 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)

6-6.1.4.6 Portable fire extinguishers other than wheeled types shall be securely installed on the hanger or in the bracket supplied, 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)

6-6.1.4.7 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)

6-6.1.4.8 Fire extinguishers installed under conditions where they are subject to physical damage shall be protected from impact. (**10:**1-6.9)

6-6.1.4.9 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 $3\ ^1/_2$ 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)

6-6.1.4.10 Operating instructions shall be located on the front of the fire extinguisher. Other labels and markings shall not be placed on the front.

Exception: In addition to manufacturers' labels, other labels that specifically relate to operation, classification, or warning information shall be permitted on the front. (**10:**1-6.11)

6-6.1.4.11 Fire extinguishers mounted in cabinets or wall recesses shall be placed in a manner such that the fire extinguisher operating instructions face outward. The location of such fire extinguishers shall be marked conspicuously. (**10:**1-6.12)

6-6.1.4.12 Where 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)

6-6.1.4.13 Water-type (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 extinguishers 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 must be placed in an enclosure capable of maintaining the stipulated range of temperatures.

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 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)

6-6.1.4.14 A fire extinguisher instruction manual shall be provided to the owner or the owner's agent giving condensed instructions and cautions necessary to the installation, operation, inspection, and maintenance of the extinguisher(s). The manual shall refer to NFPA 10, *Standard for Portable Fire Extinguishers,* as a source of detailed instruction. (**10:**1-6.15)

6-6.2 Selection of Fire Extinguishers.

6-6.2.1 General.

6-6.2.1.1 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. The number, size, placement, and limitations of use of fire extinguishers required shall meet the requirements of this section. (**10:**2-1)

6-6.2.1.2 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: Halogenated agent types of fire extinguishers installed before January 1, 1991. (**10:**2-1.1)

6-6.2.2 Selection by Hazard.

6-6.2.2.1 Fire extinguishers shall be selected for the class(es) of hazards to be protected in accordance with 6-6.2.2.2 through 6-6.2.2.5. (**10:**2-2.1)

6-6.2.2.2 Fire extinguishers for protecting Class A hazards shall be selected from the following: water-type, halogenated agent type, and multi-purpose dry chemical. (*For halogenated agent-type extinguishers, see 6-6.2.1.2.*) (**10:**2-2.1.1)

6-6.2.2.3 Fire extinguishers for protection of Class B hazards shall be selected from the following: aqueous film forming foam (AFFF), film forming fluoroprotein foam (FFFP), carbon dioxide, dry chemical types, and halogenated agent types. (*For halogenated agent-type extinguishers, see 6-6.2.1.2.*) (**10:**2-2.1.2)

6-6.2.2.4 Fire extinguishers for protection of Class C hazards shall be selected from the following: carbon dioxide and dry chemical types. (*For halogenated agent-type fire extinguishers, see 6-6.2.1.2.*)

NOTE: 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:**2-2.1.3)

6-6.2.2.5 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)

6-6.3 Distribution of Extinguishers.

6-6.3.1 General.

6-6.3.1.1 Fire extinguishers shall be provided where required by this Code and the reference codes and standards listed in Chapter 43.

6-6.3.1.2 Required building protection shall be provided by fire extinguishers suitable for Class A fires. (**10:**3-1.2.1)

6-6.3.1.3 Occupancy hazard protection shall be provided by fire extinguishers suitable for such Class A, B, C, or D fire potentials as might be present. (**10:**3-1.2.2)

6-6.3.1.4 On each floor level, the area protected and the travel distances shall be based on fire extinguishers installed in accordance with Tables 6-6.3.2.1 and 6-6.3.3.1. (**10:**3-1.4)

6-6.3.2 Fire Extinguisher Size and Placement for Class A Hazards.

6-6.3.2.1 Minimal sizes of fire extinguishers for the listed grades of hazards shall be provided on the basis of Table 6-6.3.2.1 except as modified by 6-6.3.2.4. Fire extinguishers shall be located so that the maximum travel distances shall not exceed those specified in Table 6-6.3.2.1, except as modified by 6-6.3.2.4. (**10:**3-2.1)

Table 6-6.3.2.1

	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	3,000 ft^2	1,500 ft^2	1,000 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

*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 Appendix 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 for Light (Low) Hazard Occupancies.
For SI Units: 1 ft = 0.305 m; 1 ft^2= 0.0929 m^2.

6-6.3.2.2 Certain smaller extinguishers that are charged with multipurpose dry chemical, Halon 1211, or Halon 1211/1301 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 6-6.3.2.1. (**10:**3-2.1.1)

6-6.3.2.3 Up to one-half of the complement of fire extinguishers as specified in Table 6-6.3.2.1 may 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 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)

6-6.3.2.4 Where the area of the floor of a building is less than that specified in Table 6-6.3.2.1, at least one extinguisher of the minimum size recommended shall be provided. (**10:**3-2.3)

6-6.3.2.5 The protection requirements may be fulfilled with fire extinguishers of higher rating provided the travel distance to such larger fire extinguishers shall not exceed 75 ft (22.7 m). (**10:**3-2.4)

6-6.3.3 Fire Extinguisher Size and Placement for Class B Fires Other than for Fires in Flammable Liquids of Appreciable Depth.

6-6.3.3.1 Minimal sizes of fire extinguishers for the listed grades of hazard shall be provided on the basis of Table 6-6.3.3.1. Extinguishers shall be located so that the maximum travel distances shall not exceed those specified in the table used.

Exception: Extinguishers of lesser rating, desired for small specific hazards within the general hazard area, may be used, but shall not be considered as fulfilling any part of the requirements of Table 6-6.3.3.1. (**10:**3-3.1)

Table 6-6.3.3.1

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	15.25
Extra (high)	40-B	30	9.15
	80-B	50	15.25

NOTE 1: The specified ratings do not imply that fires of the magnitudes indicated by these ratings will occur, but rather to give the operators more time and agent to handle difficult spill fires that may occur.
NOTE 2: For fires involving water-soluble flammable liquids, see 2-3.4 of NFPA 10.
NOTE 3: For specific hazard applications, see Section 2-3 of NFPA 10.

6-6.3.3.2 Two or more fire extinguishers of lower rating shall not be used to fulfill the protection requirements of Table 6-6.3.3.1.

Exception No. 1: Up to three AFFF or FFFP fire extinguishers of at least $2^1/_2$-gal (9.46-L) capacity may 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 may be used to fulfill ordinary (moderate) hazard requirements. (**10:**3-3.2)

6-6.3.3.3 The protection requirements may be fulfilled with fire extinguishers of higher ratings provided the travel distance to such larger fire extinguishers shall not exceed 50 ft (15.25 m). (**10:**3-3.3)

6-6.3.4* Fire Extinguisher Size and Placement for Class B Fires in Flammable Liquids of Appreciable Depth.

6-6.3.4.1 Portable fire extinguishers shall not be installed as the sole protection for flammable liquid hazards of appreciable depth [greater than $^1/_4$ in. (0.64 cm)] where the surface area exceeds 10 ft^2 (0.93 m^2).

Exception: Where personnel who are trained in extinguishing fires in the protected hazards, or their counterparts, are available on the premises, the maximum surface area shall not exceed 20 ft^2 (1.86 m^2). (**10:**3-4.1)

6-6.3.4.2 For flammable liquid hazards of appreciable depth, a Class B fire extinguisher shall be provided on the basis of at least 2 numerical units of Class B extinguishing potential per sq ft (0.0929 m^2) 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.)*

Exception: AFFF- or FFFP-type fire extinguishers may be provided on the basis of 1-B of protection per sq ft of hazard. (**10:**3-4.2)

6-6.3.4.3 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 fire extinguishers may 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)

6-6.3.4.4 Travel distances for portable extinguishers shall not exceed 50 ft (15.25 m). (**10:**3-4.4)

6-6.3.4.5 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)

6-6.3.5 Fire Extinguisher Size and Placement for Class C Hazards.

6-6.3.5.1* Fire extinguishers with Class C ratings shall be required where energized electrical equipment may be encountered that would require a nonconducting extinguishing medium. This includes fire either directly involving or surrounding 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 B hazard. (**10:**3-5)

6-6.3.6 Size and Placement for Class D Hazards.

6-6.3.6.1 Fire extinguishers or extinguishing agents with Class D ratings shall be provided for fires involving combustible metals. (**10:**3-6.1)

6-6.3.6.2 Fire extinguishers or extinguishing agents (media) shall be located not more than 75 ft (23 m) travel distance from the Class D hazard. (*See Appendix E-6 of NFPA 10.*) (**10:**3-6.2)

6-6.3.6.3 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)

6-6.4 Inspection, Maintenance, and Recharging.

6-6.4.1 General.

6-6.4.1.1 The owner or designated agent of a property in which extinguishers are located shall be responsible for such inspection, maintenance, and recharging. (**10:**4-1.3)

6-6.4.1.2 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)

6-6.4.1.3 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)

6-6.4.2 Maintenance.

6-6.4.2.1 Fire extinguishers shall be subjected to maintenance not more than one year apart, at the time of hydrostatic test, or when specifically indicated by an inspection. (**10:**4-4.1)

6-6.4.2.2 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 of at least equal rating. (**10:**4-4.1.5)

6-6.4.2.3* 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.

NOTE: Under special circumstances or when local requirements are in effect, additional information may be desirable or required. (**10:**4-4.3)

6-6.4.2.4 All rechargeable-type extinguishers shall be recharged after any use or as indicated by an inspection or when performing maintenance. (**10:**4-5.1.1)

6-6.4.2.5 Hydrostatic testing shall be performed by persons trained in pressure testing procedures and safeguards, and having available suitable testing equipment, facilities, and appropriate servicing manual(s). (**10:**5-1.2)

6-6.4.2.6 If, at any time, an extinguisher shows evidence of corrosion or mechanical injury, it shall be hydrostatically tested.

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 halogenated agent type extinguishers. (**10:**5-1.3)

6-6.4.2.7 Examination of Cylinder Condition. Where a fire extinguisher cylinder or shell has one or more conditions listed in this subdivision, it shall not be hydrostatically tested, but shall be destroyed by the owner or at his or her direction:

(a) Where there exist repairs by soldering, welding, brazing, or use of patching compounds.

NOTE: For welding or brazing on mild steel shells, consult the manufacturer of the fire extinguisher.

(b) Where the cylinder or shell threads are damaged.

(c) Where there is corrosion that has caused pitting, including pitting under a removable nameplate or nameband assembly.

(d) Where the fire extinguisher has been burned in a fire.

(e) Where a calcium chloride type of extinguishing agent was used in a stainless steel fire extinguisher.

(f) Where the shell is of copper or brass construction joined by soft solder or rivets.

(g) All inverting-type fire extinguishers, except wheeled type.

(h) Where a fire extinguisher has been used for any purpose other than that of a fire extinguisher. (**10:**5-1.4)

6-7* Other Fire Suppression Systems. There are other fire suppression systems that can be used as suitable for their applications. The standards noted in Table 6-7 govern the installation and use of these systems.

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

Table 6-7

Type of System	NFPA Standard
Low-Expansion Foam Systems	NFPA 11
Medium- and High-Expansion Foam Systems	NFPA 11A
Carbon Dioxide Systems	NFPA 12
Halon 1301 Systems	NFPA 12A
Sprinklers in One- and Two- Family Dwellings and Manufactured Homes	NFPA 13D
Sprinklers in Residential Occupancies Up to and Including Four Stories in Height	NFPA 13R
Water Spray Systems	NFPA 15
Deluge Foam-Water Sprinkler and Foam-Water Spray Systems	NFPA 16
Dry Chemical Extinguishing Systems	NFPA 17
Wet Chemical Extinguishing Systems	NFPA 17A

Chapter 7 Automatic Sprinkler Systems

7-1 Where Required.

7-1.1* 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 43. 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.

7-1.2 Basement areas of new occupancies exceeding 2500 ft^2(232.3 m^2) shall be protected throughout by an approved automatic sprinkler system.

7-1.3 High Rise Buildings.

7-1.3.1 New high rise buildings shall be protected throughout by an approved, automatic sprinkler system in accordance with this chapter.

7-1.3.2* Existing high rise buildings shall be protected throughout by an approved, automatic sprinkler system in accordance with this chapter and 7-1.3.2.1 and 7-1.3.2.2 below.

7-1.3.2.1 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.

7-1.3.2.2 The entire building shall be required to be protected by an approved, automatic sprinkler system within 12 years of adoption of this Code.

7-2 General.

7-2.1 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 1-17. 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.

7-2.2 Water Supply. 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 /ft^2 (6.1 L/min/m^2) of floor area throughout the entire enclosed area. An indicating shut-off valve shall be installed in an accessible location between the sprinklers and the connection to the domestic water supply. (**101:**7-7.1.2)

7-2.3 Valves on connections to water supplies, sectional control valves, and other valves in supply pipes to sprinklers shall be supervised open by one of the following methods:

(a) Central station, proprietary, or remote station signaling service.

(b) Local signaling service that will cause the sounding of an audible signal at a constantly attended point.

(c) Valves locked in the open position.

(d) 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 (a) or (b) above.

Exception: Supervision of underground gate valves with roadway boxes shall not be required. (**13:**4-14.1.1.3)

7-3 System Selection.

7-3.1 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 antifreeze systems or by other systems specifically listed for this purpose. (See 3-5.2 of NFPA 13.) (**13:**4-14.4.1.1)

7-3.2 Where water-filled supply pipes, risers, system risers, or feed mains pass through open areas, cold rooms, passageways, or other areas exposed to freezing, the pipe shall be protected against freezing by insulating coverings, frostproof casings, or other reliable means capable of maintaining a minimum temperature of 40°F (4°C). (**13:**4-14.4.1.2)

7-3.3 Dry Pipe Systems.

7-3.3.1 The dry pipe valve and supply pipe shall be protected against freezing and mechanical injury. (**13:**3-2.5.1)

7-3.3.2 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:**3-2.5.2)

7-4 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 are 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.

7-5 Inspection, Testing, and Maintenance.

7-5.1 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.

7-5.2 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.*

7-5.3 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:

(a) Before conducting any test or procedure that could result in the activation of an alarm, and

(b) After such tests or procedures are concluded. (**25:**2-1.2)

7-5.4 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 that adequate heat [minimum 40°F (4.4°C)] is available. (**25:**2-2.5)

7-5.5 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)

7-5.6 A supply of spare sprinklers (never less than six) 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)

7-5.6.1 The stock of spare sprinklers shall be as follows:

(a) For protected facilities having not over 300 sprinklers — not less than six sprinklers

(b) For protected facilities having 300 to 1000 sprinklers — not less than 12 sprinklers

(c) For protected facilities having over 1000 sprinklers — not less than 24 sprinklers. (**25:**2-4.1.5)

7-5.7 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 with small paper bags. Coverings shall be replaced when deposits or residue accumulate. (**25:**2-4.1.7)

7-5.8 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)

7-5.9 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)

7-5.10 Dry Pipe Systems. Dry pipe systems shall be maintained 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)

7-5.10.1 Air driers shall be maintained in accordance with the manufacturer's instructions. (**25:**2-4.2.1)

7-5.10.2 Compressors used in conjunction with dry-pipe sprinkler systems shall be maintained in accordance with the manufacturer's instructions. (**25:**2-4.2.2)

7-5.11 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)

Chapter 8 Fire Detection and Alarm Systems

8-1 General.

8-1.1 Where building fire alarm systems are required by other sections of this Code, they shall be provided in accordance with this chapter and NFPA 72, *National Fire Alarm Code.*

Exception: Existing installations shall be permitted to be continued in use subject to the approval of the authority having jurisdiction.

8-1.2 All apparatus requiring rewinding or resetting to maintain normal operation shall be restored to normal as promptly as possible after each test and alarm and kept in normal condition for operation. All test signals received shall be recorded to indicate date, time, and type. (**72:**7-4.3)

8-1.3 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, 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:**1-3.13.1)

8-1.4 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 1-17. 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.

8-2 Fire Alarm Systems.

8-2.1 Introduction.

8-2.1.1 Where required by this Code or the referenced codes and standards listed in Chapter 43, fire alarm systems shall provide for one or more of the following:

(a) Manual alarm signal initiation,

(b) Automatic alarm signal initiation,

(c) Monitoring of abnormal conditions in fire suppression systems,

(d) Activation of fire suppression systems,

(e) Activation of fire safety functions,

(f) Activations of alarm notification appliances,

(g) Emergency voice/alarm communications,

(h) Guard's tour supervisory service,

(i) Process monitoring supervisory systems,

(j) Activation of off-premises signals,

(k) Combination systems,

(l) Integrated systems. (**72:**3-3)

8-2.1.2 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)

8-2.1.3 A device or system having materials or forms that differ from those detailed in NFPA 72 shall be permitted to be examined and tested according to the intent of NFPA 72 and, if found equivalent, shall be approved. (**72:**1-3.2)

8-2.1.4 All initiating devices, notification appliances, and control equipment constructed and installed in conformity with NFPA 72 shall be listed for the purpose for which they are intended. (**72:**1-5.3.1)

8-2.1.5 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:**1-5.3.2)

8-2.2 Inspection, Testing, and Maintenance.

8-2.2.1 Record of Completion. A record of completion (*see Figure 1-7.2.1 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, when requested, to other authorities having jurisdiction after completion of the installation wiring tests, and a final copy shall be provided after completion of the operational acceptance tests. (**72:**1-7.2.1)

8-2.2.2 Testing. Testing shall be performed in accordance with the schedules in Table 8-2.2.2 or more frequently where required by the authority having jurisdiction. Where automatic testing is performed at least weekly by a remotely monitored fire alarm control unit specifically listed for the application, the manual testing frequency shall be permitted to be extended to annual. (*See Table 8-2.2.2.*)

Exception: Devices or equipment that is inaccessible for safety considerations, (e.g., continuous process operations, energized electrical equipment, radiation, excessive height) shall be tested during scheduled shutdowns where approved by the authority having jurisdiction but not more than every 18 months. (**72:**7-3.2)

8-2.3 Fire Alarm Boxes. 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:**5-8.1)

8-2.3.1 Each manual fire alarm box shall be securely mounted. The operable part of each manual fire alarm box shall be not less than $3\ ^1/_2$ ft (1.1 m) and not more than $4\ ^1/_2$ ft (1.37 m) above floor level. (**72:**5-8.1.1)

8-2.3.2 Manual fire alarm boxes shall be distributed throughout the protected area so that they are unobstructed and readily accessible. They shall be located in the normal path of exit from the area with a manual fire alarm box at each exit on each floor. Additional manual fire alarm boxes shall be provided so that 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:**5-8.1.2)

8-2.3.3 A coded manual fire alarm box shall produce at least three repetitions of the coded signal, each repetition to consist of at least three impulses. (**72:**5-8.1.3)

8-2.4 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 by providing a means of verification as specified in either 8-2.4.1.1 or 8-2.4.1.2. (**72:**1-7.2.3)

8-2.4.1 The installation shall be certificated. (**72:**1-7.2.3.1)

8-2.4.1.1 Central station fire alarm systems providing service that complies with all requirements of this 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:**1-7.2.3.1.1)

8-2.4.1.2 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:**1-7.2.3.1.2)

8-2.4.2 The installation shall be placarded. (**72:**1-7.2.3.2)

8-2.4.2.1 Central station fire alarm systems providing service that complies with all requirements of this 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:**1-7.2.3.2.1)

8-2.4.2.2 The placard(s) shall be 20 in.^{2} (130 cm^2) or larger, shall be located on or near the fire alarm system control unit or, if 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:**1-7.2.3.2.2)

8-2.5 Automatic Fire Detection and Alarm Service.

8-2.5.1 Automatic fire detectors shall be located, maintained, and tested in accordance with NFPA 72.

Table 8-2.2.2 Testing Frequencies

Component	Init./Reaccpt.	Monthly	Quarterly	Semiann.	Ann.	Table 7-2.2 of NFPA 72 Reference
1. Control Equipment: Fire Alarm Systems Monitored for Alarm, Supervisory, Trouble Signals						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: Fire Alarm Systems Unmonitored for Alarm, Supervisory, Trouble Signals						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	X (weekly)					
4. Batteries — Central Station Facilities						
a. Lead-Acid Type						6b
1. Charger Test	X				X	
(Replace battery as needed.)						
2. Discharge Test (30 min.)	X	X				
3. Load Voltage Test	X	X				
4. Specific Gravity	X			X		
b. Nickel-Cadmium Type						6c
1. Charger Test	X		X			
(Replace battery as needed.)						
2. Discharge Test (30 min.)	X				X	
3. Load Voltage Test	X				X	
c. Sealed Lead-Acid Type	X	X				6d
1. Charger Test		X	X			
(Replace battery as needed.)						
2. Discharge Test (30 min.)	X	X				
3. Load Voltage Test	X	X				
5. Batteries — Fire Alarm Systems						
a. Lead-Acid Type						6b
1. Charger Test	X				X	
(Replace battery as needed.)						
2. Discharge Test (30 min.)	X			X		
3. Load Voltage Test	X			X		
4. Specific Gravity	X			X		
b. Nickel-Cadmium Type						6c
1. Charger Test	X				X	

Table 8-2.2.2 Testing Frequencies (Continued)

	Component	Init./Reaccpt.	Monthly	Quarterly	Semiann.	Ann.	Table 7-2.2 of NFPA 72 Reference
	(Replace battery as needed.)						
	2. Discharge Test (30 min.)	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	X				X	
	(Replace battery every 4 years.)						
	2. Discharge Test (30 min.)	X				X	
	3. Load Voltage Test	X			X		
6.	**Batteries — Public Fire Alarm Reporting Systems**	X (daily)					
	Voltage tests in accordance with NFPA 72, Table 7-2.2, item 7, Public Reporting System Tests, paragraphs (a) through (f).						
	a. Lead-Acid Type						6b
	1. Charger Test	X				X	
	(Replace battery as needed.)						
	2. Discharge Test (2 hr)	X		X			
	3. Load Voltage Test	X		X			
	4. Specific Gravity	X			X		
	b. Nickel-Cadmium Type						6c
	1. Charger Test	X				X	
	(Replace battery as needed.)						
	2. Discharge Test (2 hr)	X				X	
	3. Load Voltage Test	X		X			
	c. Sealed Lead-Acid Type						6d
	1. Charger Test	X				X	
	(Replace battery as needed.)						
	2. Discharge Test (2 hr)	X				X	
	3. Load Voltage Test	X		X			
7.	**Fiber-Optic Cable Power**	X				X	12b
8.	**Control Unit Trouble Signals**	X				X	9
9.	**Conductors/Metallic**	X					11
10.	**Conductors/Nonmetallic**	X					12
11.	**Emergency Voice/Alarm Communications Equipment**	X				X	18
12.	**Retransmission Equipment**	X *(See 7-3.4,* of NFPA 72.)					
13.	**Remote Annunciators**	X				X	10
14.	**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	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 (*See 7-3.2.1* of NFPA 72.)						
	j. Supervisory Signal Devices (except valve tamper switches)	X		X			
	1. Valve Tamper Switches				X		
	k. Waterflow Devices	X		X			
15.	**Guard's Tour Equipment**	X				X	
16.	**Interface Equipment**	X				X	19
17.	**Special Hazard Equipment**	X				X	15

Table 8-2.2.2 Testing Frequencies (Continued)

	Component	Init./Reaccpt.	Monthly	Quarterly	Semiann.	Ann.	Table 7-2.2 of NFPA 72 Reference
18.	**Alarm Notification Appliances**						14
	a. Audible Devices	X				X	
	b. Speakers	X				X	
	c. Visible Devices	X				X	
19.	**Off-Premises Transmission Equipment**	X		X			
20.	**Supervising Station Fire Alarm Systems — Transmitters**						16, 17
	a. DACT	X				X	
	b. DART	X				X	
	c. McCulloh	X				X	
	d. RAT	X				X	
21.	**Special Procedures**	X				X	21
22.	**Supervising Station Fire Alarm Systems — Receivers**						
	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				

NOTE: For testing addressable and analog-described devices, which are normally affixed to either a single, molded assembly or are a twist lock-type affixed to a base, TESTING SHALL BE DONE UTILIZING THE SIGNALING STYLE CIRCUITS (Styles 0.5 through 7). The addressable term was determined by the Technical Committee in Formal Interpretation 79-8 on NFPA 72D and Formal Interpretation 87-1 on NFPA 72A. Analog-type detectors shall be tested with the same criteria.

8-2.5.2 Automatic alarm-initiating devices having integral trouble contacts shall be wired on the initiating device circuit so that a trouble condition within a device does not impair the alarm transmission from any other initiating device. (**72:**3-8.2.2)

NOTE: 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 8-2.5.2 shall not apply.

8-2.5.3 Systems equipped with alarm verification features shall be permitted, provided:

(a) A smoke detector continuously subjected to a smoke concentration above alarm threshold magnitude initiates a system alarm within one minute.

(b) Actuation of an alarm-initiating device other than a smoke detector causes a system alarm signal within 15 seconds. (**72:**3-8.2.3)

8-2.5.4 Where individual alarm-initiating devices are used to control the operation of equipment as permitted by 1-5.4.1.1 of NFPA 72, this control capability shall remain operable even when all of the initiating devices connected to the same circuit are in an alarm state. (**72:**3-8.2.4)

8-2.5.5 Systems that require the operation of two automatic detection devices to initiate the alarm response shall be permitted, provided:

(a) They are not prohibited by the authority having jurisdiction.

(b) There are at least two automatic detection devices in each protected space.

(c) The area protected by an automatic detection device is no more than one-half the maximum area for the detector as determined by the application of Chapter 5 of NFPA 72.

(d) The alarm verification feature is not used. (**72:**3-8.2.5)

8-2.6 Waterflow Alarm Service.

8-2.6.1 A dry-pipe sprinkler system equipped for water-flow alarm signaling shall be supervised for off-normal system air pressure. (**72:**3-8.6.4)

8-2.6.2 Automatic fire suppression system alarm-initiating devices and supervisory signal-initiating devices and their circuits shall be so designed and installed that they cannot be readily subject to tampering, opening, or removal without initiating a signal. This provision specifically includes junction boxes installed outside of buildings to facilitate access to the initiating device circuit. (**72:**3-8.10.1)

8-2.6.3 The number of waterflow switches permitted to be connected to a single initiating device circuit shall not exceed five. (**72:**3-8.5.3)

8-2.6.4 The number of supervisory devices permitted to be connected to a single initiating device circuit shall not exceed 20. (**72:**3-8.6.1.2)

8-2.6.5 Initiation of the alarm signal shall occur within 90 seconds of waterflow at the alarm-initiating device when flow equal to or greater than that from a single sprinkler of the smallest orifice size installed in the system occurs. Movement

of water due to waste, surges, or variable pressure shall not be indicated. (**72:**5-6.2)

8-2.7 Monitoring for Integrity.

8-2.7.1 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.

NOTE: The provisions of a double loop or other multiple path conductor or circuit to avoid electrical monitoring is not acceptable.

Exception No. 1: Styles of initiating device circuits, signaling line circuits, and notification appliance circuits tabulated in Tables 3-5, 3-6, and 3-7.1 of NFPA 72 that do not have an "X" under "Trouble" for the abnormal condition indicated.

Exception No. 2: Shorts between conductors, other than required by 1-5.8.3, 1-5.8.4, and 1-5.8.5.2 and Tables 3-5, 3-6, and 3-7.1 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 equivalently protected against mechanical injury.

Exception No. 6: A trouble signal circuit.

Exception No. 7: Interconnection between equipment within a common enclosure.

NOTE: NFPA 72 does not have jurisdiction over monitoring integrity of conductors within equipment, devices, or appliances.

Exception No. 8: Interconnection between enclosures containing control equipment located within 20 ft (6 m) 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. (***72***:1-5.8.1)*

8-2.7.2 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)

8-2.7.3 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:**1-5.8.3)

8-2.7.4 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 equivalently protected against mechanical injury.

Exception No. 3: Central station circuits serving notification appliances within a central station. (**72:**1-5.8.4)

8-2.8 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.

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.

NOTE: Note to 8-2.8, Exceptions No. 1 and No. 2: 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 and loss of primary power is otherwise indicated (e.g., by loss of building lighting).

Where dc voltages are employed, they shall be limited to no more than 350 volts above earth ground. (**72:**1-5.2.3).

8-3 Automatic Fire Detectors.

8-3.1 Special Definitions.

Air Sampling-Type Detector. A detector that consists of a piping or tubing distribution network 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.

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.

Spot-Type Detector. A device whose 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)

8-3.2 General Requirements.

8-3.2.1 Before requesting final approval of the installation, where required by the authority having jurisdiction, the installing contractor shall furnish a written statement to the effect 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:**1-7.1.2)

8-3.3 Installation.

8-3.3.1 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:**5-1.3.1)

8-3.3.2 In all cases, initiating devices shall be supported independently of their attachment to the circuit conductors. (**72:**5-1.3.2)

8-3.3.3 Detectors shall not be recessed into the mounting surface in any manner.

Exception: Where tested and listed for such recessed mounting. (**72:**5-1.4.1)

8-3.3.4 Spot-type heat 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. (*See Figure A-5-2.2.1 of NFPA 72.*)

Exception No. 1: In the case of solid open 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:**5-2.2.1)

8-3.3.5 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 open 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: Where a line-type detector is used in an application other than open area protection, the manufacturer's installation instruction shall be followed. (**72:**5-2.2.2)

8-3.3.6 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, where on a sidewall, between 4 in. and 12 in. (100 mm and 300 mm) down from the ceiling to the top of the detector. (*See Figure A-5-2.2.1 of NFPA 72.*)

Exception No. 1: See 5-1.4.5 of NFPA 72.

Exception No. 2: See 5-3.4.6 of NFPA 72. (**72:**5-3.4.3.1)

8-3.3.7 To minimize dust contamination of smoke detectors where installed under raised room floors and similar spaces, they shall be only mounted in an orientation for which they have been listed. (*See Figure A-5-3.4.3.2 of NFPA 72.*) (**72:**5-3.4.3.2)

8-3.3.8 Projected beam-type smoke detectors (*see A-1-4 of NFPA 72*) normally shall be located with their projected beams parallel to the ceiling and in accordance with the manufacturer's documented instructions.

Exception No. 1: See 5-1.4.5 of NFPA 72.

Exception No. 2: Beams shall be permitted to be installed vertically or at any angle needed to afford protection of the hazard involved (e.g., vertical beams through the open shaft area of a stairwell where there is a clear vertical space inside the handrails). (**72:**5-3.4.4)

8-3.3.9 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:**5-3.4.2)

8-3.3.10 Detectors shall not be installed until after the construction clean-up of all trades is complete and final.

Exception: Where required by the authority having jurisdiction for protection during construction.

Detectors that have been installed prior to final clean-up by all trades shall be cleaned or replaced per Chapter 7 of NFPA 72. (**72:**5-3.6.1.3)

8-3.3.11 High Air Movement Areas.

8-3.3.11.1 Smoke detectors shall not be located directly in the airstream of supply registers. (**72:**5-3.6.6.2)

8-3.3.11.2 Smoke detector spacing depends upon the movement of air within the room (including both supplied and recirculated air), which can be designated as minutes per air change or air changes per hour. Spacing shall be in accordance with Table 5-3.6.6.3 of NFPA 72 and Figure 5-3.6.6.3 of NFPA 72.

Exception: Air sampling or projected beam smoke detectors installed in accordance with the manufacturer's documented instructions. (**72:**5-3.6.6.3)

8-3.4 Maintenance and Testing.

8-3.4.1 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.*

8-3.4.2 Heat Detectors.

8-3.4.2.1 Fixed-Temperature, Rate-of-Rise, Rate-of-Compensation, Restorable Line, Spot-Type heat detectors (except pneumatic tube type) shall be tested with a heat source per manufacturer's recommendations for response within 1 minute. Precaution should be taken to avoid damage to the nonrestorable fixed-temperature element of a combination rate-of-rise/fixed-temperature element. (**72:**Table 7-2.2, 13, d, 1)

8-3.4.2.2 Fixed-Temperature, Nonrestorable Line Type heat detectors shall not be heat tested. Test mechanically and electrically for function. Measure and record loop resistance. Investigate changes from acceptance test. (**72:**Table 7-2.2, 13, d, 2)

8-3.4.2.3 Nonrestorable (General) heat detectors shall not be heat tested. Test mechanically and electrically for function. (**72:**Table 7-2.2, 13, d, 4)

8-3.4.2.4 Restorable Line Type, Pneumatic Tube only heat detectors shall be tested with heat source (where test chambers are in circuit) or pressure pump. (**72:**Table 7-2.2, 13, d, 5)

8-3.4.3 Smoke Detectors.

8-3.4.3.1 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 acceptable to the manufacturer, or other means acceptable to the detector manufacturer, shall be permitted as an acceptable test method. (**72:**Table 7-2.2, 13, g, 1)

8-3.4.3.2 For projected beam-type smoke detectors, 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)

8-3.4.3.3 A functional test shall be performed on all smoke detectors upon initial installation, during reacceptance tests and at least annually. (**72:**Table 7-3.2, 14, h)

Exception: Partial testing as permitted by 7-1.6.2 of NFPA 72 during reacceptance tests.

8-3.4.3.4 Detector sensitivity shall be checked within one year after installation and every alternate year thereafter. After the second required calibration test, where sensitivity tests indicate that the detector has remained within its listed and marked sensitivity range (or 4 percent obscuration light grey smoke, if not marked), the length of time between calibration tests shall be permitted to be extended to a maximum of 5 years. Where the frequency is extended, records of detector-caused nuisance alarms and subsequent trends of these alarms shall be maintained. In zone 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 either:

(a) A calibrated test method; or

(b) The manufacturer's calibrated sensitivity test instrument; or

(c) Listed control equipment arranged for the purpose; or

(d) A smoke detector/control unit arrangement whereby the detector causes a signal at the control unit where its sensitivity is outside its acceptable sensitivity range; or

(e) Other calibrated sensitivity test method acceptable to the authority having jurisdiction.

Detectors found to have a sensitivity outside the listed and marked sensitivity range shall be cleaned and recalibrated or 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 of NFPA 72 and Table 7-2.2 of NFPA 72.

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)

PART IV OCCUPANCY FIRE SAFETY REQUIREMENTS

Chapter 9 Assembly Occupancies

9-1 Application. New and existing assembly occupancies shall comply with this chapter and the referenced edition of NFPA *101.*

9-2 Operating Features.

9-2.1 Drills.

9-2.1.1 The employees or attendants of assembly occupancies shall be schooled and drilled in the duties they are to perform in case of fire, panic, or other emergency in order to effect orderly exiting. (**101:**8-7.7.1 and **101:**9-7.7.1)

9-2.1.2 Employees or attendants of assembly occupancies shall be instructed in the proper use of portable fire extinguishers and other manual fire suppression equipment if provided. (**101:**8-7.7.2 and **101:**9-7.7.2)

9-2.1.3 In theaters, motion picture theaters, auditoriums, and other similar assembly occupancies with occupant loads greater than 300 where there are noncontinuous programs, an audible announcement shall be made or projected image 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: Assembly occupancies in schools when used for nonpublic events. (***101***:8-7.7.3 and* **101***:9-7.7.3)*

9-2.2 Open Flame Devices. 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 adequate precautions satisfactory to the authority having jurisdiction are taken to prevent ignition of any combustible material and use of the pyrotechnic device complies with 9-7.3 of NFPA 101.

Exception No. 2: Open flame devices shall be permitted to be used in the following situations, provided adequate 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. 3: Heat-producing equipment complying with 7-2.2. of NFPA 101.

Exception No. 4: Food service operations in accordance with 9-7.1 of NFPA 101.

*Exception No. 5: Gas lights shall be permitted to be used provided adequate precautions satisfactory to the authority having jurisdiction are taken to prevent ignition of any combustible materials. (***101***:8-7.2 and* **101***:9-7.2)*

9-2.3 Portable Cooking Equipment. Portable cooking equipment that is not flue-connected shall be permitted only as follows:

(a) 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 adequate precautions satisfactory to the authority having jurisdiction are taken to prevent ignition of any combustible materials.

(b) Candles shall be permitted to be used on tables used for food service if securely supported on substantial noncombustible bases located so as to avoid danger of ignition of combustible materials and only if approved by the authority having jurisdiction. Candle flames shall be protected.

(c) "Flaming sword" or other equipment involving open flames and flamed dishes, such as cherries jubilee or crepe suzette, shall be permitted to be used provided necessary precautions are taken and subject to the approval of the authority having jurisdiction.

(d) Listed and approved LP-Gas commercial food service appliances as permitted by NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases.* (**101:**8-7.1.4 and **101:**9-7.1.4)

9-2.4 Smoking.

9-2.4.1 Smoking in assembly occupancies shall be regulated by the authority having jurisdiction. (**101:**8-7.8.1 and **101:**9-7.8.1)

9-2.4.2 In rooms or areas where smoking is prohibited, plainly visible "NO SMOKING" signs shall be posted. (**101**:8-7.8.2 and **101**:9-7.8.2)

9-2.4.3 No person shall smoke in prohibited areas that are so posted.

*Exception: The authority having jurisdiction shall be permitted to allow 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***:8-7.8.3 and* **101***:9-7.8.3)*

9-2.4.4 Where smoking is permitted, suitable ashtrays or receptacles shall be provided in convenient locations. (**101:**8-7.8.4 and **101:**9-7.8.4)

9-2.5 Furnishings, Decorations, and Scenery.

9-2.5.1 Fabrics and films used for decorative purposes, all draperies and curtains, and similar furnishings shall be flame resistant as demonstrated by complying with NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films.*

*Exception: For materials that show excessive melting or shrinkage or ongoing combustion at the junction of the specimen and its holder in the small-scale test, the large-scale test shall be considered applicable in accordance with the test selection provisions of NFPA 701, Standard Methods of Fire Tests for Flame-Resistant Textiles and Films. (***101***:6-6.1,* **101***:8-7.4.1, and* **101***:9-7.4.1)*

9-2.5.2 Furnishings or decorations of an explosive or highly flammable character shall not be used. (**101:**6-6.5)

9-2.5.3 Fire retardant coatings shall be maintained to retain the effectiveness of the treatment under service conditions encountered in actual use. (**101:**6-6.6)

9-2.5.4 The authority having jurisdiction shall impose controls on the amount and arrangement of combustible contents in assembly occupancies to provide an adequate level of safety to life from fire. (**101:**8-7.4.2 and **101:**9-7.4.2)

9-2.5.5 Exposed foamed plastic materials and unprotected materials containing foamed plastic used for decorative purposes or stage scenery shall have a maximum heat release rate of 100 kW when tested in accordance with UL 1975, *Standard for Fire Tests for Foamed Plastics Used for Decorative Purposes.*

*Exception: Individual foamed plastic items or items containing foamed plastic where the foamed plastic does not exceed 1 lb (0.45 kg) in weight. (***101**:8-7.4.3 and **101:**9-7.4.3)

9-2.6 Seating.

9-2.6.1 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 nor more than seven and as permitted by 9-2.6.2. All seats in balconies and galleries shall be securely fastened to the floor, except in places of religious worship. (**101:**8-7.9.1 and **101:**9-7.9.1)

9-2.6.2 Seats not secured to the floor shall be permitted in restaurants, night clubs, and other occupancies where the fastening of seats to the floor might be impracticable, provided that in the area used for seating (excluding dance floor, stage, etc.), there shall not be more than one seat for each 15 sq ft (1.4 sq m) of net floor area and adequate aisles to reach exits shall be maintained at all times.

Exception: Seating diagrams shall be submitted for approval of the authority having jurisdiction to allow increase in occupant load per 8-1.7.2 and 9-1.7.2 of NFPA 101. (**101**:8-7.9.2 and 101:9-7.9.2)

9-2.6.3 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:**8-7.9.3 and **101:**9-7.9.3)

9-2.7 Projection Room. A conspicuous sign with 1-in. (2.5-cm) block letters stating: "SAFETY FILM ONLY PERMITTED IN THIS ROOM" shall be posted on the outside of each projection room door, and within the projection room proper.

Exception: The projection room is constructed in accordance with NFPA 40, Standard for the Storage and Handling of Cellulose Nitrate Motion Picture Film. (**101**:8-4.6.3 and **101**:9-4.6.3)

9-2.8 Clothing. Clothing and personal effects shall not be stored in corridors.

Exception No. 1: Corridors protected by an automatic sprinkler system in accordance with Section 7-7 of NFPA 101.

Exception No. 2: Corridor areas protected by a smoke detection system in accordance with Section 7-6 of NFPA 101.

Exception No. 3: Storage in metal lockers, provided the required egress width is maintained. (**101**:8-7.10 and **101**:9-7.10)

9-2.9* Crowd Managers. In assembly occupancies having occupant loads greater than 1000, there shall be trained crowd managers or crowd manager supervisors at a ratio of one crowd manager/supervisor for every 250 occupants who shall have received approved training in crowd management techniques.

Exception No. 1: Assembly occupancies used exclusively for religious worship with an occupant load not more than 2000.

*Exception No. 2: Where in the opinion of the authority having jurisdiction the existence of an approved, supervised sprinkler system and the nature of the event warrant, the ratio of trained crowd managers to occupants shall be permitted to be reduced. (***101***:8-7.6 and* **101***:9-7.6)*

Chapter 10 Educational Occupancies

10-1 Application. New and existing educational occupancies shall comply with this chapter and the referenced edition of NFPA *101*.

10-2 Operating Features.

10-2.1 Drills.

10-2.1.1 Fire exit drills shall be conducted regularly in accordance with the applicable provisions of 10-2.1.2 through 10-2.1.9. (**101:**10-7.1.1 and **101:**11-7.1.1)

10-2.1.2 Fire exit drills shall be conducted as stipulated in 10-2.1.2.1 and 10-2.1.2.2. (**101:**10-7.1.2 and **101:**11-7.1.2)

10-2.1.2.1 At least one fire drill shall be conducted every month the facility is in session.

Exception: In climates where the weather is severe, the monthly fire exit drills shall be permitted to be deferred provided that the required number of fire exit drills is achieved and at least four are conducted before the drills are deferred. (**101**:10-7.1.2.1) *and* (**101**:11-7.1.2.2)

10-2.1.2.2 One additional fire exit drill shall be required within the first 30 days of operation. (**101:**10-7.1.2.2 and **101:**11-7.1.2.2)

10-2.1.3 Drills shall be executed at different hours of the day or evening, during the changing of classes, when the school is at assembly, during the recess or gymnastic periods, or during other times to avoid distinction between drills and actual fires. If a drill is called while pupils are going up and down the stairways, such as during the time classes are changing, the pupils shall be instructed to form in file and immediately proceed to the nearest available exit in an orderly manner. (**101:**10-7.1.3 and **101:**11-7.1.3)

10-2.1.4 Every fire exit drill shall be an exercise in school management for principal and teachers with the chief purpose of every drill being the complete control of the class so that the teacher can form its ranks quickly and silently, and can halt, turn, or direct the class as desired. Great emphasis shall be put upon the execution of each drill in a brisk, quiet, and orderly manner. Running shall be prohibited. If there are pupils incapable of holding their places in a line moving at a reasonable speed, provisions shall be made to have them taken care of by the more capable pupils, who will keep them from moving independently from the regular line of march. (**101:**10-7.1.4 and **101:**11-7.1.4)

10-2.1.5 Monitors shall be appointed from among the more mature pupils to assist in the proper execution of all drills. They shall be instructed to hold doors open in the line of march or to close doors when necessary to prevent the spread of fire or smoke in accordance with 5-2.1.8. of NFPA *101*. There shall be at least two substitutes for each appointment so as to provide for proper performance in case of the absence of the regular monitors. The searching of toilet or other rooms shall be the duty of teachers or other members of the staff. If the teachers are to search, this should be done after they have joined their classes to the proceeding lines. (**101:**10-7.1.5 and **101:**11-7.1.5)

10-2.1.6 As all drills simulate an actual fire condition, pupils shall not be allowed to obtain clothing after the alarm is sounded, even when in homerooms, due to the confusion that would result in forming the lines and the danger of tripping over dragging apparel. (**101:**10-7.1.6 and **101:**11-7.1.6)

10-2.1.7 Each class or group shall proceed to a predetermined point outside the building and remain there while a check is made to see that all are accounted for, leaving only when a recall signal is given to return to the building or when dismissed. Such points shall be sufficiently far away from the building and from each other as to avoid danger from any fire in the building, interference with fire department operations, or confusion among different classes or groups. (**101:**10-7.1.7 and **101:**11-7.1.7)

10-2.1.8 Where necessary for drill lines to cross roadways, signs reading "STOP! SCHOOL FIRE DRILL," or the equivalent, shall be carried by monitors to the traffic intersecting points in order to stop traffic during the period of the drill. (**101:**10-7.1.8 and **101:**11-7.1.8)

10-2.1.9 Fire exit drills in schools shall not include any fire extinguishing operations. (**101:**10-7.1.9 and **101:**11-7.1.9)

10-2.2 Notification.

10-2.2.1 Occupant notification shall be by means of an audible alarm in accordance with 7-6.3 of NFPA *101*. (**101:** 10-3.4.3.1 and **101:**11-3.4.3.1)

10-2.2.2 Where acceptable to the authority having jurisdiction, the fire alarm system shall be permitted to be used to designate class change, provided the fire alarm is distinctive in signal and overrides all other use. (**101:**10-3.4.3.2 and **101:**11-3.4.3.2)

10-2.2.3 Wherever any of the school authorities determine that an actual fire exists, they shall immediately call the local fire department using the public fire alarm system or other available facilities. (**101:**10-3.4.3.3 and **101:**11-3.4.3.3)

10-2.2.4 All fire exit drill alarms shall be sounded on the fire alarm system. (**101:**10-3.4.3.4 and **101:**11-3.4.3.4)

10-2.2.5 In order to prevent pupils from being returned to a building that is burning, the recall signal shall be one that is separate and distinct from, and cannot be mistaken for, any other signals. Such signal shall be permitted to be given by use of distinctively colored flags or banners. If the recall signal is electrical, the push buttons or other controls shall be kept under lock, the key for which shall be in the possession of the principal or some other 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 a lock. (**101:**10-3.4.3.5 and **101:**11-3.4.3.5)

10-2.3 Inspection.

10-2.3.1 It shall be the duty of principals and teachers to inspect all exit facilities daily in order to make sure that all stairways, doors, and other exits are in proper condition. (**101:**10-7.2.1 and **101:**11-7.2.1)

10-2.3.2 Open-plan buildings shall require extra surveillance to ensure that exit paths are maintained clear of obstruction and are obvious. (**101:**10-7.2.2 and **101:**11-7.2.2)

10-2.4 Furnishings and Decorations.

10-2.4.1 Draperies, curtains, and other similar furnishings and decorations in educational occupancies shall be flame resistant as demonstrated by complying with NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films.*

Exception: For materials that show excessive melting or shrinkage or ongoing combustion at the junction of the specimen and its holder in the small-scale test, the large-scale test shall be considered applicable in accordance with the test selection provisions of NFPA 701. (**101**:6-6.1, **101**:10-7.3.1, and **101**:11-7.3.1)

10-2.4.2 Furnishings or decorations of an explosive or highly flammable character shall not be used. (**101:**6-6.5)

10-2.4.3 Fire retardant coatings shall be maintained so as to retain the effectiveness of the treatment under service conditions encountered in actual use. (**101:**6-6.6)

10-2.4.4 Clothing and personal effects shall not be stored in corridors and lobbies.

Exception No. 1: Corridors protected by an automatic sprinkler system in accordance with Section 7-7 of NFPA 101.

Exception No. 2: Corridor areas protected by a smoke detection system in accordance with Section 7-6 of NFPA 101.

*Exception No. 3: Storage in metal lockers, provided the required egress width is maintained. (**101:**10-7.3.2 and **101:**11-7.3.2)*

10-2.4.5 Child-Prepared Artwork. Child-prepared 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:**10-7.4 and **101:**11-7.4)

10-2.5 Unvented Fuel-Fired Heating Equipment. Unvented fuel-fired heating equipment shall be prohibited in educational occupancies.

Exception: Gas space heaters installed in compliance with NFPA 54, National Fuel Gas Code. (**101:**10-7.5 and **101**:11-7.5)

Chapter 11 Day-Care Occupancies

11-1 Application. New and existing day-care occupancies shall comply with this chapter and the referenced edition of NFPA *101*.

11-2 General Requirements. Unvented fuel-fired heating equipment shall be prohibited in all categories of day-care facilities.

Exception: Gas space heaters installed in compliance with NFPA 54, National Fuel Gas Code. (**101**:30-7.6 and **101**:31-7.6)

11-3 Day-Care Centers.

11-3.1 Classification. This section 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). Any existing day-care home shall be allowed the option of meeting the requirements of Section 30-6 of NFPA *101* in lieu of this section. Any existing day-care home that meets the requirements of Chapter 30 of NFPA *101* shall be judged as meeting the requirements of this chapter.

Exception: Facilities that supervise clients on a temporary basis with a parent or guardian in close proximity. (**101:**31-6.1.1.1)

11-3.1.1 Family Day-Care Homes. A family day-care home is a day-care home in which more than three but fewer than seven 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). Requirements for family day-care homes are based on a minimum staff-to-client ratio of one staff for up to six clients, including the caretaker's own children under age six, with no more than two clients incapable of self-preservation. (**101:**31-6.1.4.2(a))

11-3.1.2 Group Day-Care Homes. A group day-care home is a day-care home in which at least seven 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). Requirements for group day-care homes are based on a minimum staff-to-client ratio of two staff for up to 12 clients, with no more than three clients incapable of self-preservation. This staff-to-client ratio shall be permitted to be modified by the authority having jurisdiction where safeguards in addition to those specified by this section are provided. (**101:**31-6.1.4.2(b))

11-3.2 Operating Features.

11-3.2.1 Drills.

11-3.2.1.1* Fire exit drills shall be conducted not less than once per month. Drills shall be designed in cooperation with local authorities. Responsibility for the planning and conduct of drills shall be assigned only to competent site administrators or staff members qualified to exercise leadership. (**101:**30-7.1.1 and **101:**31-7.1.1)

11-3.2.1.2* In climates where the weather is severe during the winter months, drills shall be held with sufficient frequency during warmer months to familiarize all occupants with the drill procedure, as well as completing the required 12 drills. (**101:**30-7.1.2 and **101:**31-7.1.2)

11-3.2.1.3* Drills shall be held at unexpected times and under varying conditions to simulate the unusual conditions that occur in the case of fire. (**101:**30-7.1.3 and **101:**31-7.1.3)

11-3.2.1.4* Drills shall include suitable procedures to ensure that all persons subject to the drill actually participate. (**101:**30-7.1.4 and **101:**31-7.1.4)

11-3.2.1.5* Every fire exit drill shall be an exercise for site administrators and staff members with emphasis on an orderly evacuation under proper discipline rather than on speed. Running shall be prohibited. If there are clients incapable of holding their places in a line moving at a reasonable speed, provisions shall be made to have them taken care of by staff members or more capable clients, who will keep them from moving independently of the regular line of march. (**101:**30-7.1.5 and **101:**31-7.1.5)

11-3.2.1.6 As all drills simulate an actual fire condition, clients shall not be allowed to obtain clothing after the alarm is sounded, due to the confusion that would result in forming lines and the danger of tripping over dragging apparel. (**101:**30-7.1.6 and **101:**31-7.1.6)

11-3.2.1.7 Each group shall proceed to a predetermined point outside the building and remain there while a check is made to see that all are accounted for, leaving only when a recall signal is given to return to the building or when dismissed. Such points shall be sufficiently far away from the building and from each other as to avoid danger from any fire in the building, interference with fire department operations, or confusion among different groups. (**101:**30-7.1.7 and **101:**31-7.1.7)

11-3.2.1.8* Where necessary for drill lines to cross roadways, signs reading "STOP! FIRE DRILL," or the equivalent, shall be carried by staff members or more capable clients to the traffic intersecting points in order to stop traffic during the period of the drill. (**101:**30-7.1.8 and **101:**31-7.1.8)

11-3.2.1.9* Fire exit drills in day-care occupancies shall not include any fire extinguishing operations. (**101:**30-7.1.9 and **101:**31-7.1.9)

11-3.2.2 Inspections.

11-3.2.2.1 Fire prevention inspections shall be conducted monthly by a trained senior member of the staff. A copy of the latest inspection form shall be posted in a conspicuous place in the day-care facility. (**101:**30-7.2.1 and **101:**31-7.2.1)

11-3.2.2.2* It shall be the duty of site administrators and staff members to inspect all exit facilities daily in order to make sure that all stairways, doors, and other exits are in proper condition. (**101:**30-7.2.2 and **101:**31-7.2.2)

11-3.2.2.3 Open-plan buildings shall require extra surveillance to ensure that exit paths are maintained clear of obstruction and are obvious. (**101:**30-7.2.3 and **101:**31-7.2.3)

11-3.2.3 Furnishings and Decoration.

11-3.2.3.1 Draperies, curtains, and other similar furnishings and decorations in day-care occupancies shall be flame resis-

tant as demonstrated by complying with NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films.*

Exception: For materials that show excessive melting or shrinkage or ongoing combustion at the junction of the specimen and its holder in the small-scale test, the large-scale test shall be considered applicable in accordance with the test selection provisions of NFPA 701. (**101**:6-6.1, **101**:30-7.3.1, and **101**:31-7.3.1)

11-3.2.3.2 Clothing and personal effects shall not be stored in corridors.

Exception No. 1: Corridors protected by an automatic sprinkler system installed in accordance with Section 7-7 of NFPA 101.

Exception No. 2: Corridor areas protected by a smoke detection system installed in accordance with Section 7-6 of NFPA 101.

Exception No. 3: Storage in metal lockers, provided the required egress width is maintained. (**101**:30-7.3.2 and **101**:31-7.3.2)

11-3.2.3.3 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:**30-7.3.3 and **101:**33-7.3.3)

11-3.2.3.4 Wastebaskets and other waste containers shall be made of noncombustible or other approved materials. (**101:**30-7.3.4 and **101:**31-7.3.4)

11-3.2.4* Day-Care Staff. Adequate adult staff shall be on duty, alert, awake, and in the facility at all times where clients are present. (**101:**30-7.4 and **101:**31-7.4)

11-3.2.5 Flammable Liquids and Gases. Flammable and combustible liquids shall be stored in areas accessible only to designated individuals, and as required in NFPA 30, *Flammable and Combustible Liquids Code.* (**101:**30-7.5 and **101:**31-7.5)

Chapter 12 Health Care Occupancies

12-1 Application. New and existing health care occupancies shall comply with this chapter and the referenced edition of NFPA *101.*

12-2 Operating Features.

12-2.1 Attendants, Evacuation Plan, Fire Exit Drills.

12-2.1.1 The administration of every hospital, nursing home, and limited 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 and for their evacuation to areas of refuge and for 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 12-2.1.2 to 12-2.2.3 inclusive shall apply. (**101:**12-7.1.1 and **101:**13-7.1.1)

12-2.1.2 Fire exit 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 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: The movement of infirm or bedridden patients to safe areas or to the exterior of the building shall not be required. (**101**:12-7.1.2 and **101**:13-7.1.3)

12-2.1.3 Employees of health care facilities shall be instructed in life safety procedures and devices. (**101:**12-7.1.3 and **101:**13-7.1.3)

12-2.2 Procedure in Case of Fire.

12-2.2.1 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, confinement of the effects of the fire by closing doors to isolate the fire area, and the execution of those evacuation duties as detailed in the facility fire safety plan. (**101:**12-7.2.1 and **101:**13-7.2.1)

12-2.2.2 A written facility fire safety plan shall provide for:

(a) Use of alarms
(b) Transmission of alarm to fire department
(c) Response to alarms
(d) Isolation of fire
(e) Evacuation of area
(f) Preparation of building for evacuation
(g) Extinguishment of fire. (**101:**12-7.2.2 and **101:**13-7.2.2)

12-2.2.3 All facility personnel shall be instructed in the use of and response to fire alarms, and, in addition, they shall be instructed in the use of the code phrase to ensure transmission of an alarm under the following conditions:

(a) When the individual who discovers a fire must immediately go to the aid of an endangered person.

(b) 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 alarm station and then shall execute immediately their duties as outlined in the fire safety plan. (**101:**12-7.2.3 and **101:**13-7.2.3)

12-2.3 Maintenance of Exits. Proper maintenance shall be provided to ensure the dependability of the method of evacuation selected. Facilities that find it necessary to lock exits shall at all times maintain an adequate staff qualified to release locks and conduct occupants from the immediate danger area to a place of safety in case of fire or other emergency. (**101:**12-7.3 and **101:**13-7.3)

12-2.4 Smoking. Smoking regulations shall be adopted and shall include the following minimal provisions:

(a) 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. Such areas shall be posted with "NO SMOKING" signs or the international symbol for no smoking.

Exception to (a): In health care facilities where smoking is prohibited and signs are prominently placed at all major entrances, secondary signs with no smoking language shall not be required.

(b) Smoking by patients classified as not responsible shall be prohibited.

Exception to (b): When the patient is under direct supervision.

(c) Ashtrays of noncombustible material and safe design shall be provided in all areas where smoking is permitted.

(d) 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:**12-7.4 and **101:**13-7.4)

12-2.5 Bedding, Furnishings, and Decorations.

12-2.5.1 Draperies, curtains, including cubicle curtains, and other loosely hanging fabrics and films serving as furnishings or decorations in health care occupancies shall be flame resistant as demonstrated by complying with NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films.*

Exception No. 1: For materials that show excessive melting or shrinkage or ongoing combustion at the junction of the specimen and its holder in the small-scale test, the large-scale test shall be considered applicable in accordance with the test selection provisions of NFPA 701.

Exception No. 2: Curtains at showers. (**101:**6-6.1, **101**:12-7.5.1, and **101**:13-7.5.1)

12-2.5.2 Newly introduced upholstered furniture within health care occupancies shall meet the criteria specified when tested in accordance with the methods cited in 6-6.2(b) and 6-6.3 of NFPA *101.*

Exception No. 1: Upholstered furniture belonging to the patient in sleeping rooms of nursing homes, provided that a smoke detector is installed in such rooms. Battery-powered single-station smoke detectors shall be permitted.

Exception No. 2: Upholstered furniture in rooms or spaces protected by an approved, automatic sprinkler system. (**101:**6-6.2(b), **101:**12-7.5.2, and **101:**13-7.5.2)

12-2.5.3 Newly introduced mattresses within health care occupancies shall meet the criteria specified when tested in accordance with the methods cited in 6-6.2(c) and 6-6.4 of NFPA 101.

Exception No. 1: Mattresses belonging to the patient in sleeping rooms of nursing homes, provided that a smoke detector is installed in such rooms. Battery-powered single-station smoke detectors shall be permitted.

Exception No. 2: Mattresses in rooms or spaces protected by an approved, automatic sprinkler system. (**101**:6-6.2(c), **101:**12-7.5.3, and **101:**13-7.5.3)

12-2.5.4 Furnishings or decorations of an explosive or highly flammable character shall not be used. (**101:**6-6.5)

12-2.5.5 Fire retardant coatings shall be maintained to retain the effectiveness of the treatment under service conditions encountered in actual use. (**101:**6-6.6)

12-2.5.6 Combustible decorations shall be prohibited in any health care occupancy unless flame-retardant.

Exception: Combustible decorations of such limited quantities that a hazard of fire development or spread is not present, such as photographs and paintings. (**101:**12-7.5.4 and **101**:13-7.5.4)

12-2.5.7 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 per sq ft (20.4 L per sq m). There shall be not more than 32 gal (121 L) capacity within any 64 sq ft (5.9 sq m) 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**:12-7.5.5 and **101**:13-7.5.5)

12-2.6 Portable Space Heating Devices. Portable space heating devices are prohibited in all health care and ambulatory health care facilities.

Exception: Portable space heating devices shall be permitted to be used in nonsleeping staff and employee areas where the heating elements of such devices are limited to not more than 212°F (100°C). (**101:**12-7.7 and **101:**13-7.7)

Chapter 13 Residential Board and Care Occupancies

13-1 Application. New and existing residential board and care occupancies shall comply with this chapter and the referenced edition of NFPA *101.*

13-2 Operating Features.

13-2.1 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, and for evacuating persons to areas of refuge and from the building when necessary. The plan shall include special staff response, including fire protection procedures needed to ensure the safety of any resident, and shall be amended or revised for use upon admission to the home of any resident with unusual needs. 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 at least every two months. A copy of the plan shall be readily available at all times within the facility. (**101:**22-7.1 and **101:**23-7.1)

13-2.2 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 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 their physical and mental abilities permit them to do so without additional personal risk. (**101:**22-7.2 and **101:**23-7.2)

13-2.3 Fire Exit Drills. Fire exit drills shall be conducted at least six times per year on a bimonthly basis with a minimum of 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 NFPA *101.* Exits and means of escape not used in any fire drill shall not be credited in meeting the requirements of NFPA *101* for board and care facilities.

Exception No. 1: Actual exiting from windows shall not be required to meet the requirements of this section; 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 rating 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 12-7 of NFPA 101 shall apply in such instances. (**101**:22-7.3 and **101:**23-7.3)

13-2.4 Smoking. Where smoking is permitted, noncombustible safety-type ashtrays or receptacles shall be provided in convenient locations. (**101:**22-7.4 and **101:**23-7.4)

13-2.5 Furnishings, Bedding, and Decorations.

13-2.5.1 New draperies, curtains, and other similar loosely hanging furnishings and decorations in board and care facilities shall be flame resistant as demonstrated by complying with NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films.*

Exception: For materials that show excessive melting or shrinkage or ongoing combustion at the junction of the specimen and its holder in the small-scale test, the large-scale test shall be considered applicable in accordance with the test selection provisions of NFPA 701. (**101:**6-6.1 and **101:**22-7.5.1)

13-2.5.2 New upholstered furniture within board and care facilities shall meet the requirements for Class I when tested in accordance with NFPA 260, *Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture.*

Exception: Upholstered furniture in rooms or spaces protected by an approved, automatic sprinkler system. (**101**:6-6.2(a), **101**:22-7.5.2, and **101:**23-7.5.2)

13-2.5.3 New mattresses within board and care facilities shall have a char length not exceeding 2 in. (5.1 cm) when tested in accordance with Part 1632 of the *Code of Federal Regulations*, Title 16.

Exception: Mattresses in rooms or spaces protected by an approved automatic sprinkler system. (**101**:6-6.2(c), **101:**22-7.5.3, and **101:**23-7.5.3)

Chapter 14 Ambulatory Health Care Centers

14-1 Application. New and existing ambulatory health care centers shall comply with this chapter and the referenced edition of NFPA *101.*

14-2 Operating Features.

14-2.1 Portable space heating devices shall be prohibited in all health care and ambulatory 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 are limited to not more than 212 °F (100 °C). (**101**:13-7.7)

Chapter 15 Detention and Correctional Occupancies

15-1 Application. New and existing detention and correctional occupancies shall comply with this chapter and the referenced edition of NFPA *101.*

15-2 Operating Features.

15-2.1 Attendants, Evacuation Plan, Fire Exit Drills.

15-2.1.1 Detention and correctional facilities or those portions of facilities having such occupancy shall be with 24-hour staffing. Staff shall be within three floors or 300 ft (91 m) horizontal distance of the access door of each resident housing area.

In addition, for Use Conditions III, IV, and V, as defined in NFPA *101*, *Life Safety Code,* the arrangement shall be such that the staff involved starts release of locks necessary for emergency evacuation or rescue and initiates other necessary emergency actions within two minutes of alarm.

Exception: For areas in which all locks are unlocked remotely in compliance with 15-2.11.6 of NFPA 101, staff shall not be required to be within three floors or 300 ft (194 m). (**101:**14-7.1.1 and **101:**15-7.1.1)

15-2.1.2 Provisions shall be made so that residents in Use Conditions III, IV, and V, as defined in NFPA *101*, shall be able to notify staff of an emergency. (**101:**14-7.1.2 and **101:**15-7.1.2)

15-2.1.3 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 and 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:**14-7.1.3 and **101:**15-7.1.3)

15-2.1.4 Employees of detention and correctional occupancies shall be instructed in the proper use of portable fire extinguishers and other manual fire suppression equipment. With respect to new staff, such training shall be provided promptly upon commencement of duty. With respect to existing staff, refresher training shall be provided at a minimum annually. (**101:**14-7.1.4 and **101:**15-7.1.4)

15-2.1.5 Books, clothing, and other combustible personal property allowed in sleeping rooms shall be stored in closable metal lockers or a fire-resistant container. (**101:**14-7.2 and **101:**15-7.2)

15-2.1.6 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:**14-7.3 and **101:**15-7.3)

15-2.2 Furnishings, Bedding, and Decorations.

15-2.2.1 Draperies and curtains, including privacy curtains, in detention and correctional occupancies shall be flame resistant, as demonstrated by complying with NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films.*

Exception: For materials that show excessive melting or shrinkage or ongoing combustion at the junction of the specimen and its holder in the small-scale test, the large-scale test shall be considered applicable in accordance with the test selection provisions of NFPA 701. (**101:**6-6.1, **101:**14-7.4.1, and **101:**15-7.4.1)

15-2.2.2 Newly introduced upholstered furniture within detention and correctional occupancies shall be tested in accordance with the provisions of 6-6.2(b) and 6-6.3 of NFPA *101.*

Exception: Upholstered furniture in rooms or spaces protected by an ap proved, automatic sprinkler system. (**101:**14-7.4.2 and **101:**15-7.4.2)

15-2.2.3 Newly introduced mattresses within detention and correctional occupancies shall be tested in accordance with the provisions of 6-6.2(c) and 6-6.4 of NFPA *101.*

Exception: Mattresses in rooms or spaces protected by an approved automatic sprinkler system. (**101:**14-7.4.3 and **101:**15-7.4.3)

15-2.2.4 Combustible decorations shall be prohibited in any detention or correctional occupancy unless flame-retardant. (**101:**14-7.4.4 and **101:**15-7.4.4)

15-2.2.5 Wastebaskets and other waste containers shall be of noncombustible or other approved materials. Waste containers with a capacity greater than 20 gal (76 L) shall be provided with a noncombustible lid or lid of other approved material. (**101:**14-7.4.5 and **101:**15-7.4.5)

15-2.3 Keys. All keys necessary for unlocking doors installed in means of egress shall be individually identified by both touch and sight. (**101:**14-7.5 and **101:**15-7.5)

15-2.4 Portable Space Heating Devices. Portable space heating devices shall be prohibited in all detention and correctional occupancies. (**101:**14-7.6 and **101:**15-7.6)

Chapter 16 Hotels and Dormitories

16-1 Application. New and existing hotels and dormitories shall comply with this chapter and the referenced edition of NFPA *101*.

16-2 Operating Features.

16-2.1 Hotel Emergency Organization.

16-2.1.1 Employees of hotels shall be instructed and drilled in the duties they are to perform in the event of fire, panic, or other emergency. (**101:**16-7.1.1 and **101:**17-7.1.1)

16-2.1.2 Drills of the emergency organization shall be held at quarterly intervals, covering 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:**16-7.1.2 and **101:**17-7.1.2)

16-2.2 Emergency Duties. Upon discovery of a fire, employees shall:

(a) Activate the facility fire protection signaling system, if provided, and

(b) Notify the public fire department, and

(c) Take other action as previously instructed. (**101:**16-7.2 and **101:**17-7.2)

16-2.3 Dormitories. Fire exit drills shall be conducted regularly. (**101:**16-7.3.1 and **101:**17-7.3.1)

16-2.3.1 Drills shall be designed in cooperation with the local authorities. (**101:**1-7.1)

16-2.3.2 Fire exit drills, shall be held with sufficient frequency to familiarize occupants with the drill procedure and to have the conduct of the drill a matter of established routine. Drills shall include suitable procedures to ensure that all persons in the building or all persons subject to the drill actually participate. (**101:**1-7.2)

16-2.3.3 Responsibility for the planning and conduct of drills shall be assigned only to competent persons qualified to exercise leadership. (**101:**1-7.3)

16-2.3.4 In the conduct of drills, emphasis shall be placed on orderly evacuation under proper discipline rather than on speed. (**101:**1-7.4)

16-2.3.5 Drills shall be held at expected and unexpected times and under varying conditions to simulate the unusual conditions that occur in the case of fire. (**101:**1-7.5)

16-2.4 Emergency Instructions for Residents or Guests.

16-2.4.1 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:**16-7.4.1 and **101:**17-7.4.1)

16-2.4.2 Fire safety information shall be provided to allow guests to decide either to evacuate to the outside, evacuate to an area of refuge, remain in place, or any combination of the three. (**101:**16-7.4.2 and **101:**17-7.4.2)

16-2.5 Furnishings and Decorations. New draperies, curtains, and other similar loosely hanging furnishings and decorations in hotels and dormitories shall be flame resistant, as demonstrated by complying with NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films.*

Exception: For materials that show excessive melting or shrinkage or ongoing combustion at the junction of the specimen and its holder in the small-scale test, the large scale test shall be considered applicable in accordance with the test selection provisions of NFPA 701. (**101:**6-6.1, **101:**16-3.3.4, and **101:**17-3.3.4)

16-2.6 Unvented fuel-fired heaters shall not be used.

Exception: Gas space heaters installed in compliance with NFPA 54, National Fuel Gas Code. (**101:**16-5.2.2 and **101:**17-5.2.2)

Chapter 17 Apartment Buildings

17-1 Application. New and existing apartment buildings shall comply with this chapter and the referenced edition of NFPA *101*.

17-2 Operating Features.

17-2.1 Emergency instructions shall be provided to each dwelling unit on a yearly basis indicating 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:**18-7.1 and **101:**19-7.1)

17-2.2 Unvented fuel-fired heaters shall not be used.

Exception: Gas space heaters installed in compliance with NFPA 54, National Fuel Gas Code. (**101:**18-5.2.2 and **101:**19-5.2.2)

Chapter 18 Lodging or Rooming Houses

18-1 Application. New and existing lodging or rooming houses shall comply with this chapter and the referenced edition of NFPA *101*.

18-2 Operating Features. Unvented fuel-fired heaters shall not be used.

Exception: Gas space heaters installed in compliance with NFPA 54, National Fuel Gas Code. (**101:**20-5.2.2)

Chapter 19 One- and Two-Family Dwellings

19-1 Application. New and existing one- and two-family dwellings shall comply with this chapter and the referenced edition of NFPA *101*.

19-2 Operating Features. Unvented fuel-fired heaters shall not be used.

Exception: Listed and approved unvented fuel-fired heaters in one- and two-family dwellings. (**101:**21-5.1.2)

Chapter 20 Mercantile Occupancies

20-1 Application.

20-1.1 New and existing mercantile occupancies shall comply with this chapter and the referenced edition of NFPA *101*.

20-1.2 Subclassification of Occupancy. Mercantile occupancies shall be subclassified as follows:

(a) *Class A.* All stores having aggregate gross area of more than 30,000 sq ft (2,800 sq m) or utilizing more than three levels, excluding mezzanines, for sales purposes.

(b) *Class B.* All stores of more than 3,000 sq ft (280 sq m) but not more than 30,000 sq ft (2,800 sq m) aggregate gross area, or utilizing floors above or below the street floor level for sales purposes. Mezzanines shall be permitted.

Exception to (b): If more than three floors, excluding mezzanines, are utilized, the store shall be Class A regardless of area.

(c) *Class C.* All stores of not more than 3,000 sq ft (280 sq m) gross area used for sales purposes on one story only, excluding mezzanines. (**101:**24-1.4.2.1 and **101:**25-1.4.2.1)

20-2 Operating Features.

20-2.1 Drills. In every Class A or Class B mercantile occupancy, employees shall be periodically trained in fire exit drill procedures in conformance with Section 1-7 of NFPA *101*. (**101:**24-7.1 and **101:**25-7.1)

20-2.2 Extinguisher Training. Employees of mercantile occupancies shall be periodically instructed in the use of portable fire extinguishers. (**101:**24-7.2 and **101:**25-7.2)

Chapter 21 Business Occupancies

21-1 Application. New and existing business occupancies shall comply with this chapter and the referenced edition of NFPA *101*.

21-2 Operating Features.

21-2.1 Drills. 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 fire exit drill procedures in accordance with Section 1-7 of NFPA *101* and shall hold drills periodically where practicable. (**101:**26-7.1 and **101:**27-7.1)

21-2.2 Extinguisher Training. Employees of business occupancies shall be periodically instructed in the use of portable fire extinguishers. (**101:**26-7.2 and **101:**27-7.2)

Chapter 22 Industrial Occupancies

22-1 Application. New and existing industrial occupancies shall comply with this chapter and the referenced edition of NFPA *101*.

22-2 Service Stations.

22-2.1 General Requirements.

22-2.1.1 See Section 1-15 for permits required.

22-2.1.2 Application. This section applies to new and existing automotive and marine service stations and to service stations located inside buildings.

22-2.1.3 Special Definitions.

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)

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)

Service Stations.

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.

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.

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 may be enclosed or partially enclosed by the building walls, floors, ceilings, or partitions or may 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)

22-2.2 Storage Requirements.

22-2.2.1 General Provisions.

22-2.2.1.1 Liquids shall be stored in:

(a) Approved closed containers not exceeding 60-gal (227-L) capacity;

(b) Tanks in special enclosures inside buildings as described in 22-2.2.2;

(c) Aboveground tanks supplying marine service stations as provided in 22-2.2.1.4;

(d) An approved tank that is part of a fuel dispensing system as provided for in 22-2.8.3.5;

(e) Tanks located underground as in Section 2-4 of NFPA 30, *Flammable and Combustible Liquids Code*;

(f) Tanks or containers inside service station buildings as provided for in 22-2.2.3.3 and 22-2.2.3.4; or

(g) Aboveground storage tanks located at service stations with the approval of the authority having jurisdiction and as provided for in 22-2.2.4. (**30A:**2-1.1)

22-2.2.1.2 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)

22-2.2.1.3 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)

22-2.2.1.4 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 (a) and (b).

(a) 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.

(b) 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. (**30A:**2-1.6)

22-2.2.1.5* 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)

22-2.2.2 Special Enclosures.

22-2.2.2.1 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)

22-2.2.2.2 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 this Code shall not exceed 6000 gal (22 710 L) individual or 18,000 gal (68 130 L) aggregate capacity. (**30A:**2-2.3)

22-2.2.3 Inside Buildings.

22-2.2.3.1 Except where stored in tanks as provided in 22-2.2.2, 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)

22-2.2.3.2 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)

22-2.2.3.3 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 22-2.8.7 for other possible sources of ignition. (**30A:**2-3.2)

22-2.2.3.4 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)

22-2.2.3.5 Class IIIB liquids shall be permitted to be stored in and dispensed from tanks and containers meeting the requirements of Chapters 2 and 4 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)

22-2.2.3.6 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)

22-2.2.4 Aboveground Storage Tanks at Service Stations.

22-2.2.4.1* 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)

22-2.2.4.1.1 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)

22-2.2.4.2 Tank Location and Capacity.

22-2.2.4.2.1 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)

22-2.2.4.2.2 Tanks shall be located at least:

(a) 50 ft (15 m) from the nearest important building on the same property;

(b) 50 ft (15 m) from any fuel dispenser;

(c) 50 ft (15 m) from the nearest side of a public way; and

(d) 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 22-2.2.4.4.

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 22-2.2.4.2.2(b) if the tanks are fire-resistant tanks, as defined in Section 1-2 of NFPA 30A, or are installed in vaults that comply with 22-2.2.4.4. (**30A:**2-4.2.2)

22-2.2.4.3 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 22-2.2.4.4 are not required to meet this requirement. (**30A:**2-4.3)

22-2.2.4.4 Vaults. Vaults shall be permitted to be either above or below grade and shall comply with the following:

(a) 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.

(b) Each vault and its tank shall be suitably anchored to withstand uplifting by groundwater or flooding, including when the tank is empty.

(c) 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.

(d) Each tank shall be in its own vault. Adjacent vaults may share a common wall.

(e) Connections shall be provided to permit venting of each vault to dilute, disperse, and remove any vapors prior to personnel entering the vault.

(f) Vaults that contain tanks of Class I liquids shall be provided with continuous ventilation at a rate of not less than 1 ft ^{3} per min per ft^2 of floor area (0.3 m^3 per min per m^2), but not less than 150 cfm (4 m^3 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 (30.5 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 Materials.* 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.

(g) Each vault shall be equipped with a detection system capable of detecting liquids, including water, and of activating an alarm.

(h) 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.*

(i) Vent pipes that are provided for normal tank venting shall terminate at least 12 ft (3.6 m) above ground level.

(j) 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.

(k) 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.

(l) Each vault shall be provided with a suitable means to admit a fire suppression agent.

(m) 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)

22-2.2.4.5 Fire-Resistant Tanks. Fire-resistant tanks shall be listed for the use intended and shall comply with all of the following:

(a) 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.

(b) 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.

(c) Each fire-resistant tank shall be suitably anchored to withstand uplifting by groundwater or flooding, including when the tank is empty.

(d) Each fire-resistant tank shall be resistant to damage from impact of a motor vehicle or shall be protected by suitable collision barriers.

(e) Vent pipes that are provided for normal tank venting shall terminate at least 12 ft (3.6 m) above ground level.

(f) 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)

22-2.2.4.6 Piping and Ancillary Equipment.

22-2.2.4.6.1 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)

22-2.2.4.6.2 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)

22-2.2.4.6.3 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)

22-2.2.4.6.4 If a submersible pump system is used, a listed emergency shutoff valve shall be installed at each dispensing device, as required by 22-2.4.3.5. (**30A:**2-4.6.4)

22-2.2.4.6.5 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)

22-2.2.4.6.6 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)

22-2.2.4.6.7 Piping shall be routed so that exposure to physical damage is minimized. (**30A:**2-4.6.7)

22-2.2.4.7 Physical Protection.

22-2.2.4.7.1 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)

22-2.2.4.7.2 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)

22-2.2.4.8 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)

22-2.2.4.9 Tank Filling Operations.

22-2.2.4.9.1 Delivery operations shall comply with applicable requirements of NFPA 385, *Standard for Tank Vehicles for Flammable and Combustible Liquids*, and with the requirements of 22-2.2.4.9.2 through 22.2.2.4.9.4 of NFPA 30A. (**30A:**2-4.9.1)

22-2.2.4.9.2 The delivery vehicle shall be separated from any aboveground tank by at least 25 ft (7.6 m). (**30A:**2-4.9.2)

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)

22-2.2.4.9.3 Tank filling shall not begin until the delivery operator has determined tank ullage (available capacity). (**30A:**2-4.9.3)

22-2.2.4.9.4 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)

22-2.3 Piping, Valves, and Fittings.

22-2.3.1 The design, fabrication, assembly, test, and inspection of the piping system shall be in accordance with NFPA 30, *Flammable and Combustible Liquids Code*, Chapter 3, 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)

22-2.3.2 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)

22-2.3.3 Piping shall be located so as to be protected from physical damage. (**30A:**3-3)

22-2.3.4 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)

22-2.3.5 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)

22-2.3.6 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)

22-2.3.7 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)

22-2.4 Fuel Dispensing System.

22-2.4.1 Location of Dispensing Devices and Emergency Power Cutoff.

22-2.4.1.1 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 22-2.5. (**30A:**4-1.1)

22-2.4.1.2 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 22-2.8.4.5 and 22-2.8.5.3 for applicable requirements for proper location of the emergency controls.*) (**30A:**4-1.2)

22-2.4.2 Fuel Dispensing Devices.

22-2.4.2.1 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)

22-2.4.2.2 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)

22-2.4.2.3 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)

22-2.4.2.4 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)

22-2.4.2.5 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)

22-2.4.2.6 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)

22-2.4.2.7 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)

22-2.4.2.8 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)

22-2.4.2.9 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:

(a) Only persons knowledgeable in performing the required maintenance shall perform the work.

(b) 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.

(c) The emergency shutoff valve at the dispenser, if installed, shall be closed.

(d) All vehicle traffic and unauthorized persons shall be prevented from coming within 20 ft (6 m) of the dispensing device. (**30A:**4-2.9)

22-2.4.3 Remote Pumping Systems.

22-2.4.3.1 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)

22-2.4.3.2 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)

22-2.4.3.3 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)

22-2.4.3.4 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. When an outside pump location is impractical, pumps shall be permitted to be installed inside buildings as provided for dispensers in 22-2.4.1,or in pits as provided in 4-3.5 of NFPA 30A. Pumps shall be substantially anchored and protected against physical damage. (**30A:**4-3.4)

22-2.4.3.5 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)

22-2.4.4 Vapor Recovery Systems.

22-2.4.4.1 Dispensing devices incorporating provisions for vapor recovery shall be listed. (**30A:**4-4.1)

22-2.4.4.2 Hose nozzle valves used on vapor recovery systems shall be listed. (**30A:**4-4.2)

22-2.5 Service Stations Located Inside Buildings.

22-2.5.1 General.

22-2.5.1.1 A service station shall be permitted inside a building subject to approval of the authority having jurisdiction. (**30A:**6-1.1)

22-2.5.1.2 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)

22-2.5.1.3 Interior finish of service stations shall be constructed of noncombustible or approved limited-combustible materials. (**30A:**6-1.3)

22-2.5.1.4 Door and window openings in interior walls shall be provided with listed 1 $^1/_2$-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)

22-2.5.1.5 Fire doors shall be kept unobstructed at all times. Appropriate signs and markings shall be used. (**30A:**6-1.5)

22-2.5.1.6 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)

22-2.5.2 Dispensing Area.

22-2.5.2.1 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)

22-2.5.2.2 Dispensing shall be limited to the area required to serve not more than four vehicles at one time. (**30A:**6-2.2)

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.

22-2.5.3 Ventilation.

22-2.5.3.1 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)

22-2.5.3.2 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)

22-2.5.3.3 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)

22-2.5.3.4 The exhaust system shall provide ventilation at a rate of not less than 1 cfm per ft^2 (0.3 m^3 per min per m^2) of dispensing area. (**30A:**6-3.4)

22-2.5.3.5 The exhaust system shall be installed in accordance with the provisions of NFPA 91, *Standard for Exhaust Systems for Air Conveying of Materials.* (**30A:**6-3.5)

22-2.5.3.6 The above provisions of 22-2.5.3.2 through 22-2.5.3.5 shall not apply to a service station located inside a building if two or more sides of the dispensing area are open to the building exterior such that natural ventilation can normally be expected to dissipate flammable vapors. (**30A:**6-3.6)

22-2.5.4 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)

22-2.5.5 Drainage Systems.

22-2.5.5.1 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)

22-2.5.5.2 Emergency drainage systems, if connected to public sewers or discharged into public waterways, shall be equipped with traps or separators. (**30A:**6-5.2)

22-2.6 Electrical Equipment. Where Class I liquids are stored and dispensed, electrical equipment shall meet the requirements of Chapter 7 of NFPA 30A, *Automotive and Marine Service Station Code.*

22-2.7 Heat-Producing Appliances.

22-2.7.1 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)

22-2.7.2 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)

22-2.7.2.1 Solid fuel stoves shall not be permitted in any lubrication room or service room. (**30A:**8-4.1)

22-2.7.3 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)

22-2.7.4 Electrical heat-producing appliances shall conform to Chapter 7 of NFPA 30A. (**30A:**8-6)

22-2.8 Operational Requirements.

22-2.8.1 Fuel Delivery Nozzles.

22-2.8.1.1 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)

22-2.8.1.2 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.* (**30A:**9-1.2)

22-2.8.1.3 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)

22-2.8.1.4 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)

22-2.8.1.5 Dispensing nozzles used at marine service stations shall be of the automatic-closing type without a latch-open device. (**30A:**9-1.4)

22-2.8.1.6 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)

22-2.8.2 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, Chapter 4, for further information.*) (**30A:**9-2)

22-2.8.2.1 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)

22-2.8.2.2 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)

22-2.8.3 Attendance or Supervision of Dispensing.

22-2.8.3.1 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 22-2.8.4 through 22-2.8.4.7 and 22.2.8.5 and 22-2.8.5.8. (**30A:**9-3.1)

22-2.8.3.2 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 Section 22-2.8.5. (**30A:**9-3.2)

22-2.8.3.3 The provisions of 22-2.2.1.1 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)

22-2.8.3.4 The provisions of 22-2.2.1.1 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:

(a) An inspection of the premises and operations has been made and approval granted by the authority having jurisdiction.

(b) The tank vehicle complies with the requirements covered in NFPA 385, *Standard for Tank Vehicles for Flammable and Combustible Liquids.*

(c) The dispensing hose does not exceed 50 ft (15 m) in length.

(d) The dispensing nozzle is a listed automatic-closing type without a latch-open device.

(e) Nighttime deliveries shall only be made in adequately lighted areas.

(f) The tank vehicle flasher lights shall be in operation while dispensing.

(g) Fuel expansion space shall be left in each fuel tank to prevent overflow in the event of temperature increase. (**30A:**9-3.4)

22-2.8.3.5 The provisions of 22-2.2.1.1 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:

(a) An inspection of the premises and operations has been made and approval granted by the authority having jurisdiction.

(b) The tank is safeguarded against collision, spillage, and overfill to the satisfaction of the authority having jurisdiction.

(c) The tank system is listed or approved for such aboveground use.

(d) The tank complies with requirements for emergency relief venting, the tank and dispensing system meet the electrical classification requirements of NFPA 30A, and the tank complies with the provisions of 2-1.7 of NFPA 30A.

(e) The tank storage shall comply with NFPA 30, *Flammable and Combustible Liquids Code*, Chapter 2. (**30A:**9-3.5)

22-2.8.4 Attended Self-Service Stations.

22-2.8.4.1 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)

22-2.8.4.2 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)

22-2.8.4.3 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)

22-2.8.4.4 It shall be the responsibility of the attendant to (1) prevent the dispensing of Class I liquids into portable containers not in compliance with 22-2.8.2.1 and 22-2.8.2.2, (2) prevent the use of hose nozzle valve latch-open devices that do not comply with 22-2.8.1.2, (3) control sources of ignition, and (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 22-2.8.4.1 through 22-2.8.4.7. (**30A:**9-4.4)

22-2.8.4.5 Emergency controls specified in 22-2.4.1.2 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)

22-2.8.4.6 Operating instructions shall be conspicuously posted in the dispensing area. (**30A:**9-4.6)

22-2.8.4.7 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)

22-2.8.5 Unattended Self-Service Stations.

22-2.8.5.1 Unattended self-service shall be permitted, subject to the approval of the authority having jurisdiction. Refer to NFPA 30A. (**30A:**9-5.1)

22-2.8.5.2 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)

22-2.8.5.3 Emergency controls specified in 22-2.4.1.2 shall be installed at a location acceptable to the authority having jurisdiction, but the controls shall be more than 20 ft (7 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)

22-2.8.5.4 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)

22-2.8.5.5 In addition to those warning signs specified in 22-2.8.9, 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)

22-2.8.5.6 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)

22-2.8.5.7 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)

22-2.8.5.8 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)

22-2.8.6 Drainage and Waste Disposal.

22-2.8.6.1 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)

22-2.8.6.2 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 22-2.2 and 22-2.3, until removed from the premises. (**30A:**9-6.2)

22-2.8.7 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)

22-2.8.8 Fire Control. Each service station shall be provided with one or more listed fire extinguishers that have a minimum capability of 40B: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)

22-2.8.8.1 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)

22-2.8.9 Signs. Warning signs shall be conspicuously posted in the dispensing area incorporating the following or equivalent wording: (a) WARNING — It is unlawful and dangerous to dispense gasoline into unapproved containers, (b) No Smoking, and (c) Stop Motor. (**30A:**9-9)

22-2.9 Marine Service Stations.

22-2.9.1 Scope.

22-2.9.1.1 This section shall apply to that portion of a property where liquids used as fuels are stored, handled, and dispensed from equipment located on shore, or from equipment located on piers, wharves, or floating docks into the fuel tanks of marine craft, including incidental activity, except as covered elsewhere in NFPA 30A or in other NFPA standards. (**30A:**10-1.1)

22-2.9.1.2 This section shall not apply to:

(a) Bulk plant or terminal, loading and unloading facilities;

(b) Transferring flammable or combustible liquids utilizing a flange-to-flange closed transfer piping system;

(c) Marine service stations where liquids used as fuels are stored and dispensed into the fuel tanks of marine craft of 300 gross tons (849 m^3) or more. (**30A:**10-1.2)

22-2.9.1.3 For the purpose of this section, the word "pier" shall also mean "dock," "floating dock," and "wharf." (**30A:**10-1.3)

22-2.9.2 Storage.

22-2.9.2.1 Liquids shall be stored in:

(a) Tanks located under ground as governed by Section 2-4 of NFPA 30, *Flammable and Combustible Liquids Code*, or

(b) 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)

22-2.9.2.2 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)

22-2.9.2.3 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)

22-2.9.3 Piping Systems.

22-2.9.3.1 Piping shall be located so as to be protected from physical damage. (**30A:**10-3.1)

22-2.9.3.1.1 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)

22-2.9.3.1.2 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)

22-2.9.3.2 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)

22-2.9.3.3 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)

22-2.9.3.4 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)

22-2.9.4 Fuel Dispensing Devices.

22-2.9.4.1 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)

22-2.9.4.2 Dispensing nozzles used at marine service stations shall be of the automatic-closing type without a latch-open device. (**30A:**10-4.2)

22-2.9.4.3 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)

22-2.9.4.4 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)

22-2.9.4.5 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)

22-2.9.4.6 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. Aboveground tanks located at a bulk plant shall not be connected by piping to marine service station tanks. (**30A:**10-4.6)

22-2.9.4.7 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)

22-2.9.5 Sources of Ignition. All electrical components for dispensing liquids shall be installed in accordance with Chapter 7 of NFPA 30A.

(a) 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.

(b) 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.

(c) All electrical wiring for power and lighting shall be installed on the side of the marine wharf opposite from the liquid piping system.

(d) 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)

22-2.9.6 Grounding/Bonding.

22-2.9.6.1 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)

22-2.9.6.2* 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)

22-2.9.6.3 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)

22-2.9.7 Fire Control.

22-2.9.7.1 Each marine service station shall be provided with one or more listed fire extinguishers having a minimum classification of 40B: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)

22-2.9.7.2 Piers that extend more than 500 ft (102 m) in travel distance from shore shall have a Class III standpipe installed in accordance with NFPA 14, *Standard for the Installation of Standpipe and Hose Systems.* (**30A:**10-8.2)

22-2.9.7.3 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)

22-2.9.8 Portable Tanks and Containers.

22-2.9.8.1 The provisions of 22-2.2.1.1 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)

22-2.9.8.2 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)

22-2.9.8.3 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)

22-2.9.9 Cargo Tank Fueling Facilities. The provisions of 22-2.9.2.1 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:

(a) An inspection of the premises and operations has been made and approval granted by the authority having jurisdiction.

(b) The tank vehicle complies with the requirements of NFPA 385, *Standard for Tank Vehicles for Flammable and Combustible Liquids.*

(c) The dispensing hose does not exceed 50 ft (15 m) in length.

(d) The dispensing nozzle is a listed automatic-closing type without a latch open device.

(e) Nighttime deliveries shall only be made in adequately lighted areas.

(f) The tank vehicle flasher lights shall be in operation while dispensing.

(g) Fuel expansion space shall be left in each fuel tank to prevent overflow in the event of temperature increase in accordance with 22-2.9.10.5. (**30A:**10-10.1)

22-2.9.10 General.

22-2.9.10.1 It shall be the responsibility of the attendant to (1) prevent the dispensing of Class I liquids into portable containers not in compliance with 22-2.8.2 through 22-2.8.2.2; (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 to 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)

22-2.9.10.2 Fueling shall not be undertaken at night except under well-lighted conditions. (**30A:**10-11.2)

22-2.9.10.3 During fueling operations smoking shall be forbidden on board the boat or vessel and on the dispensing site. (**30A:**10-11.3)

22-2.9.10.4 Before opening the tanks of the vessel to be fueled, the following precautions shall be taken:

(a) All engines, motors, fans, and bilge blowers shall be shut down.

(b) All open flames and smoking material shall be extinguished and all exposed heating elements shall be turned off.

(c) Galley stoves shall be extinguished.

(d) All ports, windows, doors, and hatches shall be closed. (**30A:**10-11.4)

22-2.9.10.5 After the flow of fuel has stopped:

(a) The fill cap shall be tightly secured.

(b) Any spillage shall be wiped up immediately.

(c) 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)

22-2.9.10.6 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)

22-2.9.10.7 Vessel owners or operators shall not offer their craft for fueling unless:

(a) 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.

(b) All fuel systems are designed, installed, and maintained in compliance with the specifications of the manufacturer of the vessel.

(c) 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.

(d) The electrical bonding and grounding systems of the vessel have been maintained in accordance with the specifications of its manufacturer. (**30A:**10-11.7)

22-2.9.10.8 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:

(a) Stop all engines and auxiliaries.

(b) Shut off all electricity, open flames, and heat sources.

(c) Check all bilges for fuel vapors.

(d) Extinguish all smoking materials.

(e) Close access fittings and openings that could allow fuel vapors to enter enclosed spaces of the vessel.

DURING FUELING:

(a) Maintain nozzle contact with fill pipe.

(b) Wipe up spills immediately.

(c) Avoid overfilling.

(d) Fuel filling nozzle must be attended at all times.

AFTER FUELING:

(a) Inspect bilges for leakage and fuel odors.

(b) Ventilate until odors are removed. (**30A:**10-11.8)

22-2.10 Service Stations, Pits, and Below-Grade and Sub-Floor Work Areas.

22-2.10.1 Walls, floors, and structural supports of pits and below-grade and sub-floor work areas shall be constructed of masonry, concrete, or other suitable noncombustible materials. (**30A:**5-1.1)

22-2.10.2 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 28 of NFPA *101, Life Safety Code*. Stairs shall be noncombustible, slip-proof, and constructed with no accessible space underneath. (**30A:**5-1.2)

22-2.10.3 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 per ft^2 (0.3 m^3 per min per m^2) 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)

22-3 Repair Garages.

22-3.1 General.

22-3.1.1 Application.

22-3.1.1.1 This section covers 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. (**88B:**1-1.1)

22-3.1.1.2 Repair garages shall comply with this section and NFPA 88B, *Standard for Repair Garages*. The requirements for existing buildings shall be permitted to be modified by the authority having jurisdiction if their application would be impractical, but only where it is clearly evident that an acceptable level of safety is provided.

22-3.1.2 Special Definitions.

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)

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)

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)

22-3.2 Construction.

22-3.2.1 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, floors, or floor-ceiling assemblies having a fire resistance rating of not less than two (2) hr. (**88B:**2-1.3)

22-3.2.2 Internal Subdivisions.

22-3.2.2.1 Any single area occupied for salesrooms, showrooms, offices, or similar spaces 1500 ft^2 (139.4 m^2) or more in area shall be separated from vehicle repair or parking areas by walls or partitions, floors, or floor-ceiling assemblies having a fire resistance rating of not less than two (2) hr. (**88B:**2-2.1)

22-3.2.2.2 Any single area occupied for salesrooms, showrooms, offices, or similar spaces of 1500 ft^2 (139.4 m^2) or less in area shall be separated from vehicle repair or parking areas by walls or partitions, floors, 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)

22-3.2.2.3 Parts storage areas exceeding 1500 ft^2 (139.4 m^2) shall be separated from all other portions of the building by walls, partitions, floors, or floor-ceiling assemblies having a fire resistance rating of not less than two (2) hr. (**88B:**2-2.3)

22-3.2.2.4 Garage occupancies shall be separated from other portions of a multitenanted building as required in 22-3.2.1. Heating equipment shall be separated or enclosed in accordance with 22-3.3.1.3 and 22-3.3.1.4. (**88B:**2-2.4)

22-3.2.3 Floors.

22-3.2.3.1 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)

22-3.2.3.2 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)

22-3.2.3.3 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)

22-3.2.4 Pits and Sub-Floor Work Areas. Pits and sub-floor work areas shall comply with the following:

(a) Walls, floors, and piers shall be constructed of masonry, concrete, or other suitable noncombustible material.

(b) 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 and slip resistant and constructed with no accessible storage space beneath.

(c) Ventilation and drainage of pits and sub-floor work areas shall be in accordance with the provisions of 22-3.3.3.1. (**88B:**2-7)

22-3.3 Hazards.

22-3.3.1 Heating.

22-3.3.1.1 Heating equipment shall be of an approved type. Improvised furnaces, salamanders, or space heaters shall not be permitted. (**88B:**3-2.1.1)

22-3.3.1.2 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 hereinafter specifically provided. (**88B:**3-2.1.3)

22-3.3.1.3 Heating equipment shall be installed in a detached building or room, separated from repair areas by walls or partitions, 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 one (1) hr 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 22-3.3.1.2.

Exception No. 1: Unit heaters, where installed in accordance with 3-2.3 of NFPA 88B. Ventilation requirements of this section 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. (**88B:**3-2.2)

22-3.3.1.4 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)

22-3.3.1.5 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)

22-3.3.1.6 Recirculated air shall not be taken from any floors below grade level. (**88B:**3-2.4.2)

22-3.3.2 Ventilation.

22-3.3.2.1 Combined ventilation and heating systems shall not recirculate air from areas below grade level. (**88B:**3-3.2)

22-3.3.2.2 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 cfm/sq ft (1 m^3/min per m^2) of floor area. An approved means shall be provided for introducing an equal amount of outdoor air. (**88B:**3-3.3)

22-3.3.2.3 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)

22-3.3.3 Repair Areas.

22-3.3.3.1 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 five minutes with the intake located near floor level. (**88B:**3-4.5.1)

22-3.3.3.2 Cleaning of parts shall be performed with a nonflammable 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)

22-3.3.3.3 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)

22-3.3.3.4 Direct-fired parts cleaners shall not be installed or used below grade. (**88B:**3-4.7.4)

22-3.3.4 Housekeeping.

22-3.3.4.1 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)

22-3.3.4.2 Clear aisle space shall be maintained to permit ready access to and the use of fire-fighting equipment. (**88B:**3-6.2)

22-3.3.4.3 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)

22-3.3.4.4 Metal lockers shall be provided for employees' clothes. (**88B:**3-6.4)

22-3.3.4.5 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)

22-3.3.4.6 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)

22-3.3.4.7 Smoking shall be prohibited except in designated areas subject to the approval of the authority having jurisdiction. (**88B:**3-6.7)

22-3.4 Protection.

22-3.4.1 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)

22-3.4.2 Standpipes. All repair garages that exceed a height of 50 ft (15.2 m) or 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 and Hose Systems.* (**88B:**4-4)

22-3.4.3 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)

22-4 Dry Cleaning Plants.

22-4.1 New and existing dry cleaning plants shall comply with NFPA 32, *Standard for Drycleaning Plants.*

22-4.2 See Section 1-15 for permits required.

Chapter 23 Storage Occupancies

23-1 Application.

23-1.1 New and existing storage occupancies shall comply with the referenced edition of NFPA *101.*

23-1.2 Storage occupancies used for the storage of hazardous materials also shall comply with Chapter 27.

23-2 Special Provisions.

23-2.1 The storage of combustibles up to 30 ft (9.2 m); or the storage of plastics (Group B and Group C — all configurations; Group A — free-flowing only) up to 30 ft (9.2 m) in height; or storage of Group A plastics (except free-flowing) up to 25 ft (7.6 m) in height shall comply with this section and NFPA 231, *Standard for General Storage.*

Exception: Existing buildings.

23-2.2 The storage of combustibles stored over 12 ft (3.7 m) in height on racks shall be in accordance with NFPA 231C, *Standard for Rack Storage of Materials.*

Exception: Existing buildings.

23-3 Aircraft Hangars. New aircraft hangars shall comply with NFPA 409, *Standard on Aircraft Hangars.*

23-4 Bulk Storage Elevators. Bulk storage elevators shall comply with NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Products Facilities.*

23-5 Parking Garages. New and existing parking garages shall comply with NFPA 88A, *Standard for Parking Structures.*

23-6 Tire Storage.

23-6.1 Storage of tires shall comply with NFPA 231D, *Standard for Storage of Rubber Tires.*

Exception: Existing buildings.

23-6.2 See Section 1-15 for permits required.

Chapter 24 Reserved

Chapter 25 Special Structures and High Rise Buildings

25-1 Application. New and existing special structures and high rise buildings shall comply with the referenced edition of NFPA *101.*

Chapter 26 Airports and Heliports

26-1 Construction and Protection of Airport Terminal Buildings.

26-1.1 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.*

26-1.2 Special Definitions.

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)

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)

Satellite. 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)

26-1.3 General.

26-1.3.1 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)

26-1.3.2 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)

26-1.3.3 Belowgrade 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)

26-1.4 Heating, Ventilating, Air Conditioning.

26-1.4.1 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)

26-1.4.2 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)

26-1.4.3 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)

26-1.5 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)

26-1.6 Fire Protection.

26-1.6.1 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)

26-1.6.2 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 and Hose Systems.* (**415:**2-5.4)

26-1.6.2.1 Class I standpipe systems shall be provided in buildings protected throughout by an approved automatic sprinkler system. Each $2^1/_2$-in. (63.5 mm) hose connection shall be equipped with a $2^1/_2$-in × $1^1/_2$-in. (63.5-mm × 38.2 mm) reducer and cap. (**415:**2-5.4.1)

26-1.6.2.2 Class III standpipe systems shall be provided in nonsprinklered buildings. The exceptions in NFPA 14 for Class III systems shall be applicable to this requirement. (**415:**2-5.4.2)

26-1.6.3 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 one hour. (**415:**2-5.5)

26-1.6.4 Means to alert the public fire department or the airport fire station shall be available through manual fire alarm pull stations installed in accordance with Chapter 8. (**415:**2-5.2.1)

26-1.6.5 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)

26-1.7 Covered Plane-Loading Positions. Airport terminal buildings having large 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)

26-2 Roof-Top Heliport Construction and Protection.

26-2.1 Application. Roof-top heliport construction and protection shall comply with this section and NFPA 418, *Standard for Heliports.*

26-2.2 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)

26-2.3 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)

26-2.4 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)

26-2.5 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)

26-2.5.1 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 that 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)

26-2.5.2 Means of egress from the rooftop landing pad and roof shall not obstruct flight operations. (**418:**3-4.2)

26-2.6 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)

26-2.7 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)

26-2.7.1 The foam discharge rates shall be as follows:

AFFF	0.10 gpm/ft² [4.1 (L/min)/m²]
Fluoroprotein	0.16 gpm/ft² [6.5 (L/min)/m²]
Protein	0.20 gpm/ft² [8.1 (L/min)/m²]

(**418:**3-6.1)

26-2.7.2 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)

26-2.7.3 The area of application of foam discharge for hose line systems shall be the practical critical fire area for the category of the helicopter landing facility. The duration shall be 2 minutes. (**418:**3-6.3)

Table 26-2.7.3 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 ft² (34.8 m²)
H-2	From 50 ft (15.2 m) up to but not including 80 ft (24.4 m)	840 ft² (78.0 m²)
H-3	From 80 ft (24.4 m) up to but not including 120 ft (36.6 m)	1440 ft² (133.8 m²)

*Helicopter length, including the tail boom and the rotors.

26-2.7.4 The water supply for the foam system shall be from a reliable source, approved by the authority having jurisdiction. (**418:**3-6.4)

26-2.7.4.1 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)

26-2.7.4.2 Standpipes and hose stations, if used, shall be installed in accordance with NFPA 14, *Standard for the Installation of Standpipe and Hose Systems.* (**418:**3-6.4.2)

26-2.7.4.3 Where freezing is possible, adequate freeze protection shall be provided. (**418:**3-6.4.3)

26-2.7.5 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)

26-2.7.6 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)

26-2.7.7 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)

26-2.8 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 and Hose Systems.* (**418:**3-7)

26-2.9 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. (**418:**3-8)

26-2.10 Portable Fire Extinguishers.

26-2.10.1 At least one portable fire extinguisher as specified in Table 26-2.10.1 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 26-2.10.1 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.

26-2.10.2 Portable fire extinguishers shall comply with NFPA 10, *Standard for Portable Fire Extinguishers,* Chapters 1, 4, 5, and 6. (**418:**5-2)

PART V SPECIAL PROCESSES AND MATERIAL HANDLING

Chapter 27 Oxidizers and Organic Peroxides

27-1 General Requirements.

27-1.1 Purpose. The purpose of this chapter is to provide requirements for 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.*)

27-1.2 Application. The specific requirements in this section shall apply to all oxidizers that are liquid or solid at ambient temperatures, and to commercially available organic peroxide formulations in U.S. Department of Transportation or Canadian Ministry of Transport approved packages.

Exception No. 1: This code 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)

Exception No. 2: The quantity and arrangement limits in NFPA 430, Code for the Storage of Liquid and Solid Oxidizers, shall not apply to the storage of oxidizers at manufacturing plants where oxidizers are manufactured. (**430:**1-1.3)

Exception No. 3: The storage of organic peroxide formulations in process areas where they are manufactured or used. (**43B:**1-1.2)

27-1.2.1 Paragraphs 27-2.5 through 27-2.8 and separate chapters of NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers*, specify requirements for storage of oxidizers by class where the quantities stored are in excess of those stated in Table 27-1.2.1. (**430:**1-1.1.1)

Table 27-1.2.1

Class of oxidizer	Quantity Stored
Class 1	4000 lb (1814 kg)
Class 2	1000 lb (454 kg)
Class 3	200 lb (91 kg)
Class 4	10 lb (4.5 kg)

27-1.2.2 For quantities of a class of oxidizer that are equal to or less than the quantity shown in Table 27-1.2.1 for that class, those parts of the appropriate chapter of NFPA 430 pertaining to fire prevention and sprinkler protection and compatibility for that class of oxidizers, and all of Chapter 2 of NFPA 430 shall be used as requirements. (**430:**1-1.1.2)

27-1.2.3 Existing buildings storing oxidizers that do not comply with the requirements of NFPA 430 that pertain to types of construction, separation of buildings, and fixed fire protection shall be used at the discretion of the authority having jurisdiction, provided they do not constitute a distinct hazard to life or adjoining property. (**430:**1-1.1.3)

27-1.2.4 This chapter shall not apply to explosives or blasting agents, which are covered by NFPA 495, *Explosive Materials Code*; to ammonium nitrate, which is covered in NFPA 490, *Code for the Storage of Ammonium Nitrate*; or 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 Class A explosives in accordance with NFPA 495, *Explosive Materials Code*. (**430:**1-1.2 and **43B:**1-1.3)

27-1.3 Special Definitions.

Compatible Material. A material that, when in contact with an oxidizer, will not react with the oxidizer or promote or initiate its decomposition. (**430**:1-5)

Container. Any vessel of 60 U.S. gal (227 L) or less capacity used for transporting or storing liquids. (**30:**1-6)

Deflagration. Propagation of a combustion zone at a velocity that is less than the speed of sound in the unreacted medium. (**68:**1-3)

Detonation. Propagation of a combustion zone at a velocity that is greater than the speed of sound in the unreacted medium. (**68:**1-3)

Explosion. The bursting or rupture of an enclosure or a container due to the development of internal pressure from a deflagration. (**68:**1-3)

Incompatible Material. 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)

Organic Peroxide. Any organic compound having a double oxygen or "peroxy" (-O-O-) group in its chemical structure. (**43B:**1-5)

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. (**43B:**1-5)

Classification of Organic Peroxide Formulations. For the purpose of this chapter, organic peroxide formulations shall be classified according to the system described in this section. 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 Appendix B for classification of typical organic peroxide formulations.*) (**43B:**1-6)

Class I. Those formulations that are capable of deflagration but not detonation. (**43B:**1-6.1)

Class II. Those formulations that burn very rapidly and that present a severe reactivity hazard. (**43B:**1-6.2)

Class III. Those formulations that burn rapidly and that present a moderate reactivity hazard. (**43B:**1-6.3)

Class IV. Those formulations that burn in the same manner as ordinary combustibles and that present a minimal reactivity hazard. (**43B:**1-6.4)

Class V. Those formulations that burn with less intensity than ordinary combustibles or do not sustain combustion and that present no reactivity hazard. (**43B:**1-6.5)

Organic Peroxide Storage Area. An area used for the storage of organic peroxide formulations. (**43B:**1-5)

Segregated Storage. Storage in the same room or inside area, but physically separated by distance from incompatible materials. (*See Chapter 3 of NFPA 43B, Code for the Storage of Organic Peroxide Formulations.*) (**43B:**1-7.1)

Cut-off Storage. Storage in the same building or inside area, but physically separated from incompatible materials by partitions or walls. (*See Chapter 4.*) (**43B:**1-7.2)

Detached Storage. 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 43B, Code for the Storage of Organic Peroxide Formulations.*) (**43B:**1-7.3)

Oxidizer. Any material that readily yields oxygen or other oxidizing gas, or that readily reacts to promote or initiate combustion of combustible materials. Examples of other oxidizing gases include bromine, chlorine, and fluorine. (**430:**1-5)

Classification of Oxidizers. For the purpose of this section, oxidizers shall be classified according to the system described in this section. 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. *(See definition of "Oxidizer" above).* (**430:**1-6)

Class 1. An oxidizer whose primary hazard is that it slightly increases the burning rate but does not cause spontaneous ignition when it comes in contact with combustible materials. (**430:**1-6.1)

Class 2. An oxidizer that will cause a moderate increase in the burning rate or that causes spontaneous ignition of combustible materials with which it comes in contact. (**430:**1-6.2)

Class 3. An oxidizer that will cause a severe increase in the burning rate of combustible materials with which it comes in contact or that will undergo vigorous self-sustained decomposition due to contamination or exposure to heat. (**430:**1-6.3)

Class 4. An oxidizer that can undergo an explosive reaction due to contamination or exposure to thermal or physical

shock. In addition, the oxidizer will enhance the burning rate and can cause spontaneous ignition of combustibles. (**430:**1-6.4)

27-1.4 See Section 1-15 for permits required.

27-2 Liquid and Solid Oxidizers.

27-2.1 Indoor storage of liquid and solid oxidizers shall be in accordance with this section and NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers.*

27-2.2 General Storage Arrangements.

27-2.2.1 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. (**430:**2-4.1)

27-2.2.1.1 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:**2-4.1.1)

27-2.2.2 Oxidizers shall be stored to avoid contact with incompatible materials such as ordinary combustibles, combustible or flammable liquids, greases, and those materials that could react with the oxidizer or promote or initiate its decomposition. This 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)

27-2.2.2.1 Special care shall be taken to prevent any contamination of oxidizers in storage. (**430:**2-4.2.1)

27-2.3 Retail Storage of Oxidizers.

27-2.3.1 Oxidizers in retail storage areas accessible to the public shall be arranged in retail display as described in 27-2.3.2 through 27-2.3.7. (**430:**2-4.4.1)

27-2.3.2 Shelves and vertical barriers shall be placed between incompatible materials and shall be solid and of noncombustible construction. (**430:**2-4.4.2)

27-2.3.3 Solid oxidizers shall not be stored directly beneath incompatible liquids. (**430:**2-4.4.3)

27-2.3.4 Shelves shall be no greater than 24 in. (61 cm) deep. (**430:**2-4.4.4)

27-2.3.5 Storage shall be no greater than 6 ft (1.8 m) high. (**430:**2-4.4.5)

27-2.3.6 The total amount of oxidizers in all classes shall be limited to 2 tons (1814 kg) in nonsprinklered areas and 4 tons (3630 kg) in sprinklered areas. Sprinklers shall be designed for the most severe class of oxidizer present. (**430:**2-4.4.6)

27-2.3.7 The quantities provided for sprinklered retail sales areas shall be permitted to be applied to a maximum of two sales areas within one retail sales store if the two sales areas are separated from each other by a fire partition having at least a 1-hour fire resistance rating. (**430:**2-4.4.7)

27-2.4 Where two or more different classes of oxidizers are stored in the same segregated, cut-off, 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)

27-2.5 Class 1 Oxidizers.

27-2.5.1 The storage of Class 1 oxidizers shall be segregated, cutoff, or detached. (**430:**3-2.1)

27-2.5.2 Storage of Class 1 oxidizers shall be in accordance with Tables 27-2.5.2(a) and 27-2.5.2(b). (**430:**3-2.2)

27-2.5.3 The building limit (tons) shall be permitted to be four times the quantities shown in Table 27-2.5.2(b) if all of the following conditions are met:

(a) Storage is cut off or detached;

(b) Storage is located in nonretail occupancies; and

(c) Noncombustible containers are used or buildings are noncombustible.

NOTE: Only the building limit, not the pile limit, height, or width, can be increased by this provision. (**430:**3-2.3)

Table 27-2.5.2(a) Storage of Class 1 Oxidizers Nonsprinklered Building

	Nonretail Establishment	Retail Establishment*
Building limit (tons)	200 (181 met ton)	15 (13.6 met ton)
Pile limit (tons)	20 (18 met ton)	2 (1.8 met ton)
Pile height (ft)	8 (2.4 m)	6 (1.8 m)
Pile width (ft)	16 (4.9 m)	8 (2.4 m)
Maximum distance from any container to a working aisle (ft)	8 (2.4 m)	4 (1.2 m)
Distance to next pile (ft)	** **	** **
Distance to wall (ft)	4 (1.2 m)	4 (1.2 m)
Distance to incompatible material (ft)	12 (3.7 m)	10 (3 m)

*Totals in this column are for storage in those areas of a retail occupancy not accessible to the public and separated from the sales display area by a minimum of 1-hr fire-resistive construction. For storage in retail sales display areas, see 27-2.3.
**Aisle width equal to pile height.

27-2.5.4 Bulk Storage.

27-2.5.4.1 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)

27-2.5.4.2 Bulk storage, either in permanent bins or in piles, shall be separated from all other materials. (**430:**3-2.4.2)

27-2.5.4.3 Bins shall be of noncombustible construction. (**430:**3-2.4.3)

Exception: Wooden bins shall be permitted to be protected with a compatible coating to prevent impregnation of the combustible material by the oxidizer.

Table 27-2.5.2(b) Storage of Class 1 Oxidizers Sprinklered Building*

	Nonretail Establishment	Retail Establishment**
Building limit (tons)	2000 (1814 met ton)	30 (27 met ton)
Pile limit (tons)	200 (181 met ton)	4 (3.6 met ton)

Table 27-2.5.2(b) Storage of Class 1 Oxidizers Sprinklered Building*

	Nonretail Establishment	Retail Establishment**
Pile height (ft)	12 (3.7 m)	8 (2.4 m)
Pile width (ft)	24 (7.3 m)	12 (3.7 m)
Maximum distance from any container to a working aisle (ft)	12 (3.7 m)	6 (1.8 m)
Distance to next pile (ft)	*** ***	*** ***
Distance to wall (ft)	2 (0.6 m)	2 (0.6 m)
Distance to incompatible material (ft)	8 (2.4 m)	8 (2.4 m)

*If the storage is to be considered sprinklered, see Section 27-2.5.5.
**Totals in this column are for storage in those areas of a retail occupancy not accessible to the public, and separated from the sales display area by a minimum of 1-hr fire-resistive construction. For storage in retail sales display areas, see 27-2.3.
***Aisle width equal to pile height.

27-2.5.4.4 Storage shall be managed to prevent excessive dust accumulation. (**430:**3-2.4.4)

27-2.5.5 Sprinkler Protection.

27-2.5.5.1 Sprinkler protection for Class 1 oxidizers shall be in accordance with NFPA 231, *Standard for General Storage*, or NFPA 231C, *Standard for Rack Storage of Materials*, whichever is applicable. (**430:**3-3.1)

27-2.5.5.2 For the purpose of applying the requirements of NFPA 231, *Standard for General Storage*, and NFPA 231C, *Standard for Rack Storage of Materials,* 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; as a Class 2 commodity where contained in fiber packs or noncombustible containers in combustible packaging; and as a Class 3 commodity where contained in plastic containers. (**430:**3-3.2)

27-2.5.5.3 Sprinkler protection shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.* (**430:**3-3.3)

27-2.6 Class 2 Oxidizers.

27-2.6.1 The storage of Class 2 oxidizers shall be segregated, cutoff, or detached. (**430:**4-2.1)

27-2.6.2 Cutoff walls shall have a fire resistance rating of at least one hour. (**430:**4-2.2)

Table 27-2.6.3(a) Storage of Class 2 Oxidizers Nonsprinklered Building

	Segregated Storage		Cutoff Storage		Detached Storage
	Process Plant General Warehouse	Retail Establishment*	Process Plant General Warehouse	Retail Establishment*	
Building limit (tons)	50 (45 met ton)	10 (8.8 met ton)	200 (181 met ton)	15 (13.6 met ton)	300 (272 met ton)
Pile limit (tons)	10 (8.8 met ton)	1 (0.91 met ton)	20 (18.1 met ton)	2 (1.8 met ton)	30 (27.2 met ton)
Pile height (ft)	6 (1.8 m)	4 (1.2 m)	8 (2.4 m)	8 (2.4 m)	8 (2.4 m)
Pile width (ft)	8 (2.4 m)	8 (2.4 m)	12 (3.7 m)	8 (2.4 m)	16 (4.9 m)
Maximum distance from any container to a working aisle (ft)	4 (1.2 m)	4 (1.2 m)	6 (1.8 m)	4 (1.2 m)	8 (2.4 m)
Distance to next pile (ft)	** **	** **	** **	** **	** **
Distance to wall (ft)	4 (1.2 m)	4 (1.2 m)	4 (1.2 m)	4 (1.2 m)	4 (1.2 m)
Distance to incompatible material (ft)	12 (3.7 m)	12 (3.7 m)	*** ***	*** ***	*** ***

*Totals in this column are for storage in those areas of a retail occupancy not accessible to the public and separated from the sales display area by a cutoff wall in accordance with 27-2.6.2. For storage in retail sales display areas, see 27-2.3.
**Aisle width equal to pile height.
***Not permitted by definition.

Table 27-2.6.3 (b) Storage of Class 2 Oxidizers Sprinklered Building*

	Segregated Storage		Cutoff Storage		Detached Storage
	Process Plant General Warehouse	Retail Establishment**	Process Plant General Warehouse	Retail Establishment**	
Building limit (tons)	100 (91 met ton)	20 (18.1 met ton)	1000(907 met ton)	30 (27.2 met ton)	2000(1814 met ton)
Pile limit (tons)	20 (18.1 met ton)	2 (1.8 met ton)	100 (91 met ton)	5 (4.5 met ton)	200 (181 met ton)
Pile height*** (ft)	*** ***	*** ***	*** ***	*** ***	*** ***
Pile width (ft)	16 (4.9 m)	8 (2.4 m)	25 (7.6 m)	8 (2.4 m)	25 (7.6 m)
Maximum distance from any container to a working aisle (ft)	8 (2.4 m)	4 (1.2 m)	12 (3.7 m)	6 (1.8 m)	12 (3.7 m)
Distance to next pile (ft)	**** ****	**** ****	**** ****	**** ****	**** ****

Table 27-2.6.3 (b) Storage of Class 2 Oxidizers Sprinklered Building* (Continued)

	Segregated Storage		Cutoff Storage		Detached Storage
	Process Plant General Warehouse	Retail Establishment**	Process Plant General Warehouse	Retail Establishment**	
Distance to wall (ft)	2 (0.6 m)	2 (0.6 m)	2 (0.6 m)	2 (0.6 m)	2 (0.6 m)
Distance to incompatible material (ft)	12 (3.7 m)	12 (3.7 m)	***** *****	***** *****	***** *****

*If the storage is considered to be sprinklered, see Section 4-4 of NFPA 430.
**Totals in this column are for storage in those areas of a retail occupancy not accessible to the public and separated from the sales display area by a cutoff wall in accordance with 27-2.6.2. For storage in retail sales display areas see 27-2.3.
***See 4-2.7 and Table 4-4.1 of NFPA 430.
****Aisle width equal to pile height.
*****Not permitted by definition.

27-2.6.3 Storage of Class 2 oxidizers shall be in accordance with Tables 27-2.6.3(a) and 27-2.6.3(b). (**430:**4-2.3)

27-2.6.4 The building limit (tons) shall be permitted to be four times the quantities shown in Table 27-2.6.3(b) if all of the following conditions are met:

(a) Storage is cutoff or detached;

(b) Storage is located in nonretail occupancies; and

(c) Noncombustible containers are used or buildings are noncombustible.

NOTE: Only the building limit, not the pile limit, height, or width, can be increased by this provision. (**430:**4-2.4)

27-2.6.5 Storage in glass carboys shall not be more than two carboys high. (**430:**4-2.5)

27-2.6.6 Storage in basements shall be prohibited.

Exception: Where the oxidizer is stored in fixed tanks. (**430:**4-2.6)

27-2.6.7 Building Construction.

27-2.6.7.1 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)

27-2.6.7.2 Storage areas for oxidizing materials in combustible containers shall be provided with means to vent fumes in a fire emergency. (**430:**4-3.2)

27-2.6.8 Sprinkler Protection.

27-2.6.8.1 Sprinkler protection for Class 2 oxidizers shall be designed in accordance with Table 4-4.1 of NFPA 430. (**430:**4-4.1)

27-2.6.8.2 Sprinkler protection shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.* (**430:**4-4.2)

27-2.6.9 Detached Storage.

27-2.6.9.1 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)

27-2.6.9.2 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)

27-2.7 Class 3 Oxidizers.

27-2.7.1 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)

27-2.7.2 Class 3 oxidizer storage shall be on the ground floor only. (**430:**5-2.2)

27-2.7.3 Cutoff walls shall have a fire resistance rating of at least 2 hr. (**430:**5-2.3)

27-2.7.4 Storage of Class 3 oxidizers shall be in accordance with Tables 27-2.7.4(a) and 27-2.7.4(b). (**430:**5-2.4)

27-2.7.5 The building limit (tons) shall be permitted to be twice the quantities shown in Table 27-2.7.4(b) if all of the following conditions are met:

(a) Storage is cutoff or detached;

(b) Noncombustible containers are used or buildings are noncombustible; and

(c) Storage is located in nonretail occupancies.

NOTE: Only the building limit, not the pile limit, height, or width, can be increased by this provision. (**430:**5-2.5)

Table 27-2.7.4(a) Storage of Class 3 Oxidizers Nonsprinklered Building

	Segregated Storage		Cutoff Storage		Detached Storage
	Process Plant General Warehouse	Retail Establishment*	Process Plant General Warehouse	Retail Establishment*	
Building limit (tons)	20 (18.1 met ton)	10 (8.8 met ton)	100 (91 met ton)	15 (13.6 met ton)	200 (181 met ton)
Pile limit (tons)	5 (4.5 met ton)	1.0 (0.91 met ton)	10 (9.1 met ton)	2 (1.8 met ton)	30 (27.2 met ton)
Pile height (ft)	6 (1.8 m)	4 (1.2 m)	6 (1.8 m)	6 (1.8 m)	6 (1.8 m)
Pile width (ft)	8 (2.4 m)	4 (1.2 m)	12 (3.7 m)	8 (2.4 m)	12 (3.7 m)

Table 27-2.7.4(a) Storage of Class 3 Oxidizers Nonsprinklered Building (Continued)

	Segregated Storage		Cutoff Storage		Detached Storage
	Process Plant General Warehouse	Retail Establishment*	Process Plant General Warehouse	Retail Establishment*	
Maximum distance from any container to a working aisle (ft)	4 (1.2 m)	4 (1.2 m)	8 (2.4 m)	4 (1.2 m)	8 (2.4 m)
Distance to next pile (ft)	** **	** **	** **	** **	** **
Distance to wall (ft)	4 (1.2 m)	4 (1.2 m)	4 (1.2 m)	4 (1.2 m)	4 (1.2 m)
Distance to incompatible material (ft)	12 (3.7 m)	12 (3.7 m)	*** ***	*** ***	*** ***

*Totals in this column are for storage in those areas of a retail occupancy not accessible to the public and separated from the sales display area by a cutoff wall in accordance with 27-2.7.3. For storage in retail sales display areas see 27-2.3.
**Aisle width equal to pile height.
***Not permitted by definition.

Table 27-2.7.4(b) Storage of Class 3 Oxidizers Sprinklered Building *

	Segregated Storage		Cutoff Storage		Detached Storage
	Process Plant General Warehouse	Retail Establishment**	Process Plant General Warehouse	Retail Establishment**	
Building limit (tons)	50 (45 met ton)	20 (18.1 met ton)	500 (454 met ton)	30 (27.2 met ton)	1500 (1360 met ton)
Pile limit (tons)	10 (8.8 met ton)	2 (1.8 met ton)	30 (27.2 met ton)	4 (3.6 met ton)	100 (91 met ton)
Pile height*** (ft)	*** ***	*** ***	*** ***	*** ***	*** ***
Pile width (ft)	12 (3.7 m)	8 (2.4 m)	16 (4.9 m)	8 (2.4 m)	20 (6.1 m)
Maximum distance from any container to a working aisle (ft)	8 (2.4 m)	4 (1.2 m)	10 (3 m)	6 (1.8 m)	10 (3 m)
Distance to next pile (ft)	**** ****	**** ****	**** ****	**** ****	**** ****
Distance to wall (ft)	2 (0.6 m)	2 (0.6 m)	2 (0.6 m)	2 (0.6 m)	2 (0.6 m)
Distance to incompatible material (ft)	12 (3.7 m)	12 (3.7 m)	***** *****	***** *****	***** *****

*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.
**Totals in this column are for storage in those areas of a retail occupancy not accessible to the public and separated from the sales display area by a cutoff wall in accordance with 27-2.7.3. For storage in retail sales display areas see 27-2.3.
***See 5-2.8 and Table 5-4-1 of NFPA 430.
****Aisle width equal to pile height.
*****Not permitted by definition.

27-2.7.6 Storage in glass carboys shall be one carboy high. (**430:**5-2.6)

27-2.7.7 Bulk storage in open bins or piles shall not be permitted. (**430:**5-2.7)

27-2.7.8 Building Construction.

27-2.7.8.1 Buildings used for the storage of liquid Class 3 oxidizers shall not have basements. (**430:**5-3.1)

27-2.7.8.2 Construction materials that can come in contact with oxidizers shall be noncombustible. (**430:**5-3.2)

27-2.7.8.3 Storage areas for oxidizing materials in combustible containers shall be provided with means to vent fumes in a fire emergency. (**430:**5-3.3)

27-2.7.9 Sprinkler Protection.

27-2.7.9.1 Sprinkler protection for Class 3 oxidizers shall be designed in accordance with Table 5-4.1 of NFPA 430. (**430:**5-4.1)

27-2.7.9.2 Sprinkler protection shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.* (**430:**5-4.2)

27-2.7.10 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 from any inhabited building, passenger railroad, public highway, or other tanks. The minimum separation distance shall be as follows:

(a) 50 ft (15 m) for a sprinklered building, or

(b) 75 ft (23 m) for an unsprinklered building. (**430:**5-5)

27-2.8 Class 4 Oxidizers.

27-2.8.1 The storage of Class 4 oxidizers shall be detached. (**430:**6-2.1)

27-2.8.2 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 27-2.8.2. (**430:**6-2.2)

Table 27-2.8.2 Storage of Class 4 Oxidizers in Drums, Containers, Cases

	Nonsprinklered Building	Sprinklered Building
Piles		
Length (ft)	10 (3.0 m)	10 (3.0 m)
Width (ft)	4 (1.2 m)	4 (1.2 m)
Height (ft)	4 (1.2 m)	8 (2.4 m)
Distance to next pile (ft)	6 (1.8 m)	8 (2.4 m)
Quantity Limit per building (tons)	1 (0.9 met tons)	No Limit

27-2.8.3 Bulk storage in piles or fixed bins shall not be permitted. (**430:**6-2.3)

27-2.8.4 Building Construction and Location.

27-2.8.4.1 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)

27-2.8.4.2 Storage areas shall be provided with means to vent fumes in an emergency. (**430:**6-3.2)

27-2.8.4.3 A storage building or storage tank shall be located not less than the minimum distance shown in Table 27-2.8.4.3 from flammable liquid storage, combustible material in the open, and from any inhabited building, passenger railroad, public highway, property line, or tank. (**430:**6-3.3)

Table 27-2.8.4.3 Separation of Buildings, Tanks Containing Class 4 Oxidizers

Weight of Class 4 Oxidizer		Distance	
(lb)	(kg)	(ft)	(m)
over 10 to 100	(4.5 to 45.4)	75	(23)
101 to 500	(45.8 to 227)	100	(30)
501 to 1,000	(227 to 454)	125	(38)
1,001 to 3,000	(454 to 1361)	200	(61)
3,001 to 5,000	(1361 to 2268)	300	(91)
5,001 to 10,000	(2268 to 4536)	400	(122)
over 10,000	(over 4536)	Subject to approval by the authority having jurisdiction.	

Note: Where tanks are not separated from each other by 10 percent of the distance specified for the largest tank, the total contents of all tanks shall be used when using this table. (**430:**6-3.4)

27-2.8.4.4 Sprinkler Protection.

27-2.8.4.4.1 Sprinkler protection for Class 4 oxidizers shall be installed on a deluge sprinkler system to provide water density of 0.35 gal/min/ft^2 (14.4 L/min/m^2) over the entire storage area. (**430:**6-4.1)

27-2.8.4.4.2 Sprinkler protection shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.* (**430:**6-4.2)

27-3 Organic Peroxide Formulations.

27-3.1 Indoor Storage.

27-3.1.1 Indoor storage of organic peroxide formulations shall be in accordance with the provisions of this section and NFPA 43B, *Code for the Storage of Organic Peroxide Formulations.*

27-3.1.2 Class I organic peroxide formulations are not permitted in public assembly, educational or health care or detention and correctional occupancies, or in classrooms of business occupancies used for adult instruction.

Exception: Arrangements approved by the authority having jurisdiction.

27-3.1.3 Storage areas shall be maintained within the recommended storage temperature range for the materials stored. (*See Appendix B of NFPA 43B for compounds needing refrigeration systems.*) (**43B:**2-4.1)

27-3.2 All storage areas containing organic peroxide formulations shall be conspicuously identified by the words "Organic Peroxides" and by the class, as defined in 27-1.3. (**43B:**2-1)

27-3.2.1 When organic peroxide formulations having different classifications as defined by 27-1.3 are stored in the same area, the area shall be marked for the most severe class present. (**43B:**2-1.1)

27-3.2.2 Packages containing organic peroxide formulations shall be individually marked with the chemical name of the organic peroxide or with other information suitable and adequate to allow proper area classification as required by this section. (**43B:**2-1.2)

27-3.2.3 Packages containing organic peroxide formulations that require temperature control shall be marked with the recommended storage temperature range. (**43B:**2-1.3)

27-3.3 General Storage Requirements.

27-3.3.1 Storage shall be arranged to facilitate manual access and handling, to maintain pile stability, to minimize breakage and spillage, and to promote good housekeeping. (**43B:**2-11.1)

27-3.3.2 A clear space of at least 2 ft (0.6 m) shall be maintained between organic peroxide storage and uninsulated metal walls. (**43B:**2-11.2)

27-3.3.3 Separation Distance.

27-3.3.3.1 Incompatible materials and flammable liquids shall not be stored within 25 ft (8.8 m) of organic peroxide formulations. The effective separation distance shall be maintained by floor slope, drains or dikes to prevent flammable 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 requirements of NFPA 30 or NFPA 43B shall apply. (**43B:**2-11.3.1)

27-3.3.3.2 As an alternative to the 25 ft (8.8 m) separation distance, a 1 hr fire barrier shall be permitted. (**43B:**2-11.3.2)

27-3.3.4 Only closed containers and packages shall be permitted in storage areas. (**43B:**2-11.4)

27-3.3.5 Bulk storage in fixed bins or piles shall not be permitted. (**43B:**2-11.5)

27-3.3.6 Storage of Class V organic peroxide formulations need only meet the requirements of NFPA 231, *Standard for General Storage*, or NFPA 231C, *Standard for Rack Storage of Materials*, as applicable. (**43B:**2-11.6)

27-3.3.7 Storage of Class IV organic peroxide formulations shall meet the following requirements:

(a) Bags, drums, and other containers and packages shall not be stored more than 10 ft (3 m) high. Pile width shall not exceed 16 ft (5 m).

(b) At least one main aisle, at least 4 ft (1.2 m) wide, shall be provided to divide the storage area. All other aisles shall be not less than 3 ft (0.9 m) wide. (**43B:**2-11.7)

27-3.3.8 Storage of Class III and Class II organic peroxide formulations shall meet the following requirements:

(a) Bags and other containers and packages shall not be stored more than 8 ft (2.4 m) high. Pile width shall not exceed 8 ft (2.4 m).

(b) 55-gal (208-L) drums shall be stored one high only.

(c) At least one main aisle, at least 6 ft (1.8 m) wide, shall be provided to divide the storage area. All other aisles shall be not less than 4 ft (1.2 m) wide. (**43B:**2-11.8)

27-3.3.9 Storage of Class I organic peroxide formulations shall meet the following requirements:

(a) Bags, drums, and other containers and packages shall not be stored more than 6 ft (1.8 m) high. Pile width shall not exceed 4 ft (1.2 m).

(b) At least one main aisle, at least 8 ft (2.4 m) wide, shall be provided to divide the storage area. All other aisles shall be not less than 4 ft (1.2 m) wide. (**43B:**2-11.9)

27-3.4 Storage Limitations.

27-3.4.1 Storage of organic peroxide formulations shall be limited to those areas within the scope of NFPA 43B, *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 27-3.4.1(a) and 27-3.4.1(b). (**43B:**2-10.1)

27-3.4.2 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. (**43B:**2-10.2)

27-3.4.3 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. (**43B:**2-10.3)

27-3.4.4 Organic peroxide formulations shall not be stored where they can be exposed to explosive materials. (**43B:**2-10.4)

Table 27-3.4.1(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[2] 50 ft	100 ft	150 ft
I	N/A	N/A	1000 lb	4000 lb	10,000 lb
II	N/A	2000 lb	20,000 lb	80,000 lb	500,000 lb
III	1500 lb	3000 lb[1]	70,000 lb	200,000 lb	750,000 lb
IV	100,000 lb	200,000 lb	300,000 lb	500,000 lb	1,000,000 lb
V	UNL	UNL	UNL	UNL	UNL

[1]Shall be permitted to be increased to 20,000 lb if the walls or partitions providing the cut-off have a fire resistance of at least four hours.
[2]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 from the nearest important building on the same property.
N/A = Not Allowed
UNL = Unlimited
For SI Units: 1 lb = 0.454 kg; 1 ft = 0.305 m.

Table 27-3.4.1(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[2] 50 ft	100 ft	150 ft
I	N/A	2000 lb[1]	2000 lb	20,000 lb	175,000 lb
II	4000 lb	50,000 lb	100,000 lb	200,000 lb	UNL
III	50,000 lb	100,000 lb	200,000 lb	UNL	UNL
IV	UNL	UNL	UNL	UNL	UNL
V	UNL	UNL	UNL	UNL	UNL

[1]Interior walls shall have a blast resistance of 432 psf (0.2 bar). Exterior walls shall be provided with deflagration venting. (See Chapter 4 of NFPA 43B.)
[2]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 from the nearest important building on the same property.
N/A = Not Allowed
UNL = Unlimited
For SI Units: 1 lb = 0.454 kg; 1 ft = 0.305 m.

27-3.4.5 Where required by other provisions of NFPA 43B, 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/ft^2 (20.4 Lpm/m^2)
Class II — 0.40 gpm/ft^2 (16.3 Lpm/m^2)
Class III — 0.30 gpm/ft^2 (12.2 Lpm/m^2)
Class IV — 0.25 gpm/ft^2 (10.2 Lpm/m^2) (**43B:**2-8.2)

27-3.4.5.1 The system shall be designed to provide the required density over a 3000 ft^2 (279 m^2) area for areas protected by a wet pipe sprinkler system or 3900 ft^2 (363 m^2) for areas protected by a dry pipe sprinkler system. The entire area of any building of less than 3000 ft^2 (279 m^2) shall be used as the area of application. (**43B:**2-8.2.1)

27-3.4.5.2 Where required, water supplies for automatic sprinklers, fire hydrants, etc., 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. (**43B:**2-8.3)

27-3.5 Segregated Storage. This section shall apply to the storage of organic peroxide formulations when stored under segregated conditions as defined in 27-1.3 of this code and in quantities not exceeding those shown in Table 27-3.4.1(a) and Table 27-3.4.1(b). (**43B:**3-1)

27-3.5.1 If there are any floors or open spaces located below the organic peroxide storage area, the floor of the storage area shall be made watertight 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. (**43B:**3-3)

27-3.5.2 Storage Arrangement.

27-3.5.2.1 A minimum 8-ft (2.4-m) clear space shall be maintained between organic peroxide storage and any other storage. (**43B:**3-4.1)

27-3.5.2.2 Segregated storage areas shall meet all applicable requirements of NFPA 231, *Standard for General Storage*, or NFPA 231C, *Standard for Rack Storage of Materials*, as applicable. (**43B:**3-4.2)

27-3.5.2.3 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. (*See NFPA 220, Standard on Types of Building Construction.*) (**43B:**3-4.3)

27-3.6 Cut-off Storage. This section shall apply to the storage of organic peroxide formulations when stored under cut-off conditions as defined in 27-1.3 of this code and in quantities not exceeding those shown in Tables 27-3.4.1(a) and 27-3.4.1(b). (**43B:**4-1)

27-3.6.1 Building Construction.

27-3.6.1.1 Cut-off storage areas for Class I, Class II, or any refrigerated organic peroxide formulations shall be single story, without basements or crawl spaces. (**43B:**4-3.1)

27-3.6.1.2 Where any Class I organic peroxide formulations are stored in excess of 100 lb, internal walls and any wall, roof, or ceiling that exposes another occupied building shall be capable of withstanding an internal overpressure of 432 psf (0.2 bar). (**43B:**4-3.2)

27-3.6.1.3 Where Class II or any refrigerated organic peroxide formulations are stored, any internal walls or any wall, roof, or ceiling that exposes another occupied building shall be capable of withstanding an internal overpressure of 125 psf (0.06 bar). (**43B:**4-3.3)

27-3.6.1.4 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.

NOTE: Refer to manufacturers' technical data for information on organic peroxide formulations that give off flammable gases upon decomposition. (**43B:**4-3.4)

27-3.6.1.5 Any walls common with another building shall have a fire resistance of at least two hours, as measured by the procedure described in NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*. (**43B:**4-3.5)

27-3.6.1.5.1 Any door or window openings in such walls shall be protected by approved fire doors and fire windows suitable for the opening and installed according to NFPA 80, *Standard for Fire Doors and Fire Windows*. (**43B:**4-3.5.1)

27-3.6.2 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. (*See NFPA 220, Standard on Types of Building Construction.*) (**43B:**4-4)

27-3.7 Detached Storage. This section shall apply to the storage of organic peroxide formulations when stored under detached conditions as defined in 27-1.3 and in quantities and at separation distances as specified in Tables 27-3.4.1(a) and 27-3.4.1(b). (**43B:**5-1)

27-3.7.1 Building Location.

27-3.7.1.1 Detached storage buildings shall be separated from the lines of property that is or can be built upon, including the opposite side of a public way, or from the nearest important building on the same property. (**43B:**5-3.1)

27-3.7.1.2 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 27-3.4.1(a) and 27-3.4.1(b). (**43B:**5-3.2)

27-3.7.1.3 For Class I organic peroxide formulations, detached storage buildings shall be separated from each other in accordance with Table 27-3.7.1.3. (**43B:**5-3.3)

Table 27-3.7.1.3 Separation of Individual Storage Buildings from Each Other

NS	Quantity, lb	1000	4000	10,000
	Distance, ft	20	75	100
AS	Quantity, lb	2000	20,000	175,000
	Distance, ft	20	75	100

NS = Not Sprinklered
AS = Has Sprinklers
For SI Units: 1 lb = 0.454 kg; 1 ft = 0.305 m.

27-3.7.2 Building Construction and Utilities.

27-3.7.2.1 Detached storage buildings shall be single story, without basement or crawl space. (**43B:**5-4.1)

27-3.7.2.2 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. (**43B:**5-4.2)

27-3.7.2.3 Sun shields such as those illustrated in Figure A-5-4.3 of NFPA 43B shall be permitted to be used for detached storage buildings in those areas where the temperature inside the storage building can approach or exceed the maximum recommended storage temperature. (**43B:**5-4.3)

27-3.7.3 Fire Protection.

27-3.7.3.1 Where required, automatic sprinkler systems and their water supplies shall meet the requirements of 27-3.4.5 of this code and 2-8.3 of NFPA 43B. (**43B:**5-5.1)

27-3.7.3.2 Where required for Class I organic peroxide formulations in quantities exceeding 2000 lb (908 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.* (**43B:**5-5.2)

27-3.8 In addition to the provisions of Section 27-3, exterior storage areas for organic peroxide formulations exceeding the maximum quantities specified in Tables 27-3.4.1(a) and 27-3.4.1(b) shall be located a minimum distance of 50 ft (15 m) from other hazardous materials storage.

Chapter 28 Flammable and Combustible Liquids

28-1 Application.

28-1.1* The storage, handling, and use of flammable and combustible liquids, including waste liquids, shall comply with the requirements of NFPA 30, *Flammable and Combustible Liquids Code.*

28-1.2 This chapter shall not apply to the following:

(a) 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;

(b) Any liquefied gas or cryogenic liquid as defined in Section 1-6 of NFPA 30;

(c) 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;

(d) Any aerosol product;

(e) Any mist, spray, or foam;

(f) 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.*

28-1.3 This chapter shall also not apply to the following:

(a) Transportation of flammable and combustible liquids, as governed by the U S. Department of Transportation.

(b) Storage, handling, and use of fuel oil tanks and containers connected with oil burning equipment.

28-2 Flammable and Combustible Liquids in Laboratories. The use of flammable and combustible liquids within laboratories shall comply with NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*, or NFPA 99, *Standard for Health Care Facilities*, Chapter 10, as appropriate.

28-3 Permit Required. See Section 1-15 for permits required.

Chapter 29 Aerosol Products

29-1 Application.

29-1.1 The manufacture, storage, and display of aerosol products shall be in accordance with NFPA 30B, *Code for the Manufacture and Storage of Aerosol Products.*

29-1.2 This chapter shall not apply to the following:

(a) The manufacture, storage, and display of aerosol products that contain only a nonflammable base product and a nonflammable propellant. (**30B:**1-1.2)

(b) The storage and display of containers whose contents are comprised entirely of LP-Gas products. (*See NFPA 58, Standard for the Storage and Handling of Liquefied Petroleum Gases.*) (**30B:**1-1.3)

Chapter 30 Liquefied Petroleum Gases/Liquefied Natural Gases

30-1 General Provisions.

30-1.1 Application.

30-1.1.1 The storage and handling of liquefied petroleum gases (LP-Gas or LPG) shall be in accordance with this chapter and NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases.*

30-1.1.2 Plans for fixed (stationary) installations of LP-Gas utilizing storage containers of over 2,000 gal (7.6 m^3) individual water capacity, or with aggregate water capacity exceeding 4,000 gal (15.1 m^3), shall be submitted to the authority having jurisdiction before the installation is started. (**58:**1-4.1)

30-1.2 See Section 1-15 for permits required.

30-1.3 Special Definitions.

ASME. American Society of Mechanical Engineers. (**58:**1-6)

ASME Container (or Tank). A container constructed in accordance with the ASME Code. (**58:**1-6)

Cylinder. A portable container constructed to DOT (formerly ICC) cylinder specifications or, in some cases, constructed in accordance with the ASME Code of a similar size and for similar service. The maximum size permitted under DOT specifications is 1,000 lb (454 kg) water capacity. (**58:**1-6)

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)

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)

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)

30-2 LP-Gas Equipment and Appliances.

30-2.1 Containers.

30-2.1.1 Refrigerated containers shall comply with Chapter 9 of NFPA 58. (*See Appendices C and D of NFPA 58.*) (**58:**2-2.1.2)

30-2.1.2 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,* applicable at the date of manufacture; and as follows:

(a) Adherence to applicable ASME Code Case Interpretations and Addenda shall be considered as compliance with the ASME Code.

(b) Containers fabricated to earlier editions of regulations, rules, or codes listed in 30-2.1.2 and the ICC *Rules for Construction of Unfired Pressure Vessels,* prior to April 1, 1967, shall be permitted to be continued in use in accordance with 1-1.4 of NFPA 58. (**58:**2-2.1.3)

30-2.1.3 Containers showing serious denting, bulging, gouging, or excessive corrosion shall be removed from service. (**58:**2-2.1.6)

30-2.1.4 Repair or alteration of containers shall comply with the regulations, rules, or code under which the container was fabricated. Other welding is permitted only on saddle plates, lugs, or brackets attached to the container by the container manufacturer. (**58:**2-2.1.7)

30-2.1.5 Containers for general use shall not have individual water capacities greater than 120,000 gal (454 m^3). Containers in dispensing stations shall have an aggregate water capacity not greater than 30,000 gal (114 m^3). This capacity restriction shall not apply to LP-Gas bulk plants, industrial plants, or industrial applications. (**58:**2-2.1.8)

30-2.1.6 Portable containers of 1,000 lb (454 kg) [nominal 120 gal (0.5 m^3)] water capacity or less shall incorporate protection against physical damage to container appurtenances and immediate connections to these while in transit, storage, while being moved into position for use, and when in use except in residential and commercial installations, by

(a) Recessing connections into the container so that valves will not be struck if the container is dropped on a flat surface, or,

(b) A ventilated cap or collar designed to permit adequate 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. Collars shall be designed so that they do not interfere with the free operation of the cylinder valve. (**58:**2-2.4.1)

30-2.1.7 Portable containers of more than 1,000 lb (454 kg) [nominal 120 gal (0.5 m^3)] water capacity, including skid tanks or for use as cargo containers, shall incorporate protection against physical damage to container appurtenances by recessing, 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)

30-2.1.8 Horizontal containers of 2,000 gal (7.6 m^3) water capacity or less, designed for permanent installation in stationary service, shall be permitted to be equipped with nonfireproofed structural steel supports and designed to allow mounting on firm foundations in accordance with the following:

(a) For installation on concrete foundations raised above the ground level by more than 12 in. (305 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. (305 mm), below the outside bottom of the container shell.

(b) 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. (**58:**2-2.5.2)

30-2.1.9 Containers to be used as portable storage containers for temporary stationary service (normally less than 6 months at any given location) and to be moved only when substantially empty of liquid shall comply with the following:

(a) If mounted on legs or supports, such supports shall be of steel and shall either 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 is 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.

(b) If the container is mounted on a trailer or semitrailer running gear so that the unit can be moved by a conventional over-the-road tractor, 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 shall also comply with applicable state and DOT motor carrier regulations and shall be approved by the authority having jurisdiction. (**58:**2-2.5.4)

30-2.1.10 Container Markings.

30-2.1.10.1 Containers shall be marked as provided in the regulations, rules, or code under which they are fabricated and in accordance with the following:

(a) Where LP-Gas and one or more other compressed gases are to be stored or used in the same area, the containers shall be marked "Flammable" and either "LP-Gas," "LPG," "Propane," or "Butane." Compliance with marking requirements of Title 49 of the *Code of Federal Regulations* shall meet this provision.

(b) When being transported, portable DOT containers shall be marked and labeled in accordance with Title 49 of the *Code of Federal Regulations.* (**58:**2-2.6.1)

30-2.1.10.2 Portable DOT containers designed to be filled by weight, including those optionally filled volumetrically but that may require check weighing, shall be marked withthe following:

(a) The water capacity of the container in lb.

(b) The tare weight of the container in lb, fitted for service. The tare weight is the container weight plus the weight of all permanently attached valves and other fittings, but does not include the weight of protecting devices removed in order to load the container. (**58:**2-2.6.2)

30-2.1.10.3 ASME containers shall be marked in accordance with the following:

(a) 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 to minimize corrosion of the nameplate or its fastening means and not contribute to corrosion of the container.

Exception: When 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.

(b) Service for which the container is designed; i.e., underground, aboveground, or both.

(c) Name and address of container supplier or trade name of container.

(d) Water capacity of container in lb or U.S. gal.

(e) Design pressure in psi.

(f) The wording "This container shall not contain a product having a vapor pressure in excess of ____ psi at 100°F (37.8°C)." *(See Table 2-2.2.2 of NFPA 58.)*

(g) Tare weight of container fitted for service for containers to be filled by weight.

(h) Outside surface area in sq ft.

(i) Year of manufacture.

(j) Shell thickness ____ head thickness.

(k) OL ____ OD ____ HD ____.

(l) Manufacturer's serial number.

(m) ASME Code symbol. (**58:**2-2.6.3)

30-2.2 Container Appurtenances. Container appurtenances shall be fabricated of materials suitable for LP-Gas service and resistant to the action of LP-Gas under service conditions and shall comply with Section 2-3 of NFPA 58.

30-2.3 Piping (Including Hose), Fittings, and Valves.

30-2.3.1 Piping (including hose), fittings, and valves shall comply with Section 2-4 of NFPA 58.

30-2.3.2 Emergency shutoff valves shall be approved and incorporate all of the following means of closing:

(a) Automatic shutoff through thermal (fire) actuation. When fusible elements are used they shall have a melting point not exceeding 250°F (121°C).

(b) Manual shutoff from a remote location.

(c) Manual shutoff at the installed location. (**58:**2-4.5.4)

30-2.3.3 Hose, hose connections, and flexible connectors shall be fabricated of materials 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 a stainless steel. (**58:**2-4.6.1)

30-2.3.4 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)

30-3 Installation of LP-Gas Systems.

30-3.1 General Provisions.

30-3.1.1 Location of Containers.

30-3.1.1.1 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 Tables 3-2.2.2, 3-2.2.4, and 3-2.2.7(f) of NFPA 58. (**58:**3-2.2.2)

30-3.1.1.2 The following provisions shall also apply:

(a) Containers shall not be stacked one above the other.

(b) Loose or piled combustible material and weeds and long dry grass shall not be permitted within 10 ft (3.0m) of any container.

(c) 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.

NOTE: For information on determination of flash points, see NFPA 30, *Flammable and Combustible Liquids Code.*

(d) 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.

(e) 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 (6.0 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 m^3) or less water capacity are installed adjacent to fuel oil supply tanks of 660 gal (2.5 m^3) or less capacity.

(f) The minimum separation between LP-Gas containers and oxygen or gaseous hydrogen containers shall be in accordance with Table 3-2.2.7(f) of NFPA 58.

Exception: Shorter distances shall be permitted where protective structures having a minimum fire resistance rating of 2 hr 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 the Note to 30-3.1.1.3.

NOTE: 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, on gaseous hydrogen systems.

(g) 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.*

(h) 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.

(i) 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.*

(j) 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)

30-3.1.1.3 Structures such as fire walls, fences, earth or concrete barriers, and other similar structures shall be avoided around or over installed nonrefrigerated containers.

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 30-3.1.1.2(c).

Exception No. 3: Structures between LP-Gas containers and gaseous hydrogen containers shall be permitted in accordance with 30-3.1.1.2(f).

Exception No. 4: Fences shall be permitted in accordance with 30-3.2.1 of this document.

NOTE: 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)

30-3.1.2 Installation of Containers. Containers shall be installed in accordance with items (a) through (f):

(a) DOT cylinder specification containers shall be installed only aboveground, and shall be set upon a firm foundation, or otherwise firmly secured. Flexibility shall be provided in the connecting piping.

(b) All containers shall be positioned so that the pressure relief valve is in direct communication with the vapor space of the container.

(c) 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.

(d) The installation position of ASME containers shall make all container appurtenances accessible for their normally intended use.

(e) 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 30-2.1.4.

(f) Aboveground containers shall be kept properly painted. (**58:**3-2.4.1)

30-3.1.3 Installation of Pipe, Tubing, Pipe and Tubing Fittings, Valves, and Hose.

30-3.1.3.1 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 3-2.8.9 of NFPA 58*). The use of nonmetallic pipe, tubing, or hose for permanently interconnecting such containers shall be prohibited. (**58:**3-2.8.6)

30-3.1.3.2 Underground metallic piping shall be protected against corrosion as warranted by soil conditions (*see 3-2.12 of NFPA 58*).

LP-Gas piping shall not be used as a grounding electrode. (**58:**3-2.8.8)

30-3.1.3.3 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:

(a) The appliance connected shall be of a portable type.

(b) For use inside buildings, the hose shall be of a minimum length, not exceeding 6 ft (1.8 m) [except as provided for 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 30-3.3.2.6). 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.

(c) Hose shall be securely connected to the appliance. The use of rubber slip ends shall not be permitted.

(d) A shutoff valve shall be provided in the piping immediately upstream of the inlet connection of the hose. When more than one such appliance shutoff is located near another, precautions shall be taken to prevent operation of the wrong valve.

(e) Hose used for connecting appliances to wall or other outlets shall be protected against physical damage. (**58:**3-2.8.11)

30-3.1.4 Vehicle Fuel Dispenser and Dispensing Stations.

30-3.1.4.1 Application. This section includes location, installation, and operating provisions for vehicle fuel dispensers and dispensing stations. The general provisions of Section 3-2 of NFPA 58 shall apply unless specifically modified in this section.

30-3.1.4.2 Location.

30-3.1.4.2.1 Location shall be in accordance with Table 3-2.3.3 of NFPA 58. (**58:**3-9.2.1)

30-3.1.4.2.2 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 (4.5 m) of, a sewer systems opening. (**58:**3-9.2.2)

30-3.1.4.3 General Installation Provisions.

30-3.1.4.3.1 Vehicle fuel dispensers and dispensing stations shall be installed as recommended by the manufacturer. (**58:**3-9.3.1)

30-3.1.4.3.2 Installation shall not be within a building but shall be permitted to be under weather shelter or canopy, pro-

vided this area is adequately ventilated and is not enclosed for more than 50 percent of its perimeter. (**58:**3-9.3.2)

30-3.1.4.3.3 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)

30-3.1.4.3.4 An excess-flow check valve complying with 2-3.3.3(b) of NFPA 58 or an emergency shutoff valve complying with 2-4.5.4 of NFPA 58 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)

30-3.1.4.3.5 Piping and the dispensing hose shall be provided with hydrostatic relief valves as specified in 3-2.9 of NFPA 58. (**58:**3-9.3.5)

30-3.1.4.3.6 Protection against trespassing and tampering shall be in accordance with 30-3.2.1. (**58:**3-9.3.6)

30-3.1.4.3.7 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)

30-3.1.4.3.8 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)

30-3.1.4.3.9 A listed quick-acting shutoff valve shall be installed at the discharge end of the transfer hose. (**58:**3-9.3.9)

30-3.1.4.3.10 A clearly identified and 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 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)

30-3.1.4.4 Installation of Vehicle Fuel Dispensers.

30-3.1.4.4.1 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)

30-3.1.4.4.2 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)

30-3.1.4.4.3 Dispensing devices for liquefied petroleum gas shall be located at least 10 ft (3.0 m) from any dispensing device for Class I liquids. (**58:**3-9.4.3)

30-3.2 Distributing and Industrial LP-Gas Systems.

30-3.2.1 Protection against Tampering for Systems Covered by Sections 3-3 and 3-9 of NFPA 58. 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:

(a) 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 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 sq ft (9 m^2) 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 need not be required.

(b) 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)

30-3.2.2 Lighting. If operations are normally conducted during other than daylight hours, adequate lighting shall be provided to illuminate storage containers, containers being loaded, control valves, and other equipment. (**58:**3-3.7)

30-3.3 LP-Gas Systems in Buildings or on Building Roofs or Exterior Balconies.

30-3.3.1 General Provisions for Containers, Equipment, Piping, and Appliances.

30-3.3.1.1 Containers, regulating equipment, manifolds, pipe, tubing, and hose shall be located so as 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)

30-3.3.1.2 Heat-producing equipment shall be located and used to minimize the possibility of the ignition of combustibles. (**58:**3-4.2.5)

30-3.3.1.3 Where containers are located on a floor, roof, or balcony, provisions shall be made to minimize the possibility of containers falling over the edge.

(a) Filling containers on roofs or balconies shall be prohibited. See 3-2.3.1(c) of NFPA 58. (**58:**3-4.2.6)

30-3.3.1.4 Transportation (movement) of containers within a building shall comply with the following:

(a) Movement of containers having water capacities greater than 2.7 lb (1.2 kg) and filled with no more than 16.8 oz (0.522 kg) of LP-Gas within a building shall be restricted to movement directly associated with the uses covered by 30-3.3.2 through 30-3.3.8 and shall be conducted in accordance with these provisions and 30-3.3.1.4(b) through (d).

(b) Valve outlets on containers having water capacities greater than 2.7 lb (1.2 kg) and filled with no more than 16.8 oz (0.522 kg) of LP-Gas shall be tightly plugged or capped and shall comply with the provisions of 30-2.1.6.

(c) Only emergency stairways not generally used by the public shall be used, and precautions shall be taken to prevent the container from falling down the stairs.

(d) Freight or passenger elevators shall be permitted to be used when occupied only by those engaged in moving the container. (**58:**3-4.2.7)

30-3.3.1.5 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 container mounting (*see 30-3.3.2.3*). Container 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 Btuh (53 MJ/h), and those manufactured prior to May 17, 1967, with inputs of more than 100,000 Btuh (105 MJ/h), shall be equipped with either one of the following:

(a) A pilot that must be lighted and proved before the main burner can be turned on, or

(b) An approved electric ignition system.

Exception: The provisions of 30-3.3.1.5 shall not be applicable to the following:

(a) Tar kettle burners, hand torches, or melting pots.

*(b) Portable heaters with less than 7,500 Btuh (8 MJ/h) input if used with containers 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)*

30-3.3.2 Buildings Under Construction or Undergoing Major Renovation.

30-3.3.2.1 Containers shall be permitted to be used and transported in buildings or structures under construction or undergoing major renovation when such buildings are not occupied by the public or, if partially occupied by the public, containers 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 30-3.3.2.2 through 30-3.3.2.7. (**58:**3-4.3.1)

30-3.3.2.2 For temporary heating, such as curing concrete, drying plaster, and similar applications, heaters (other than integral heater-container units covered in 30-3.3.2.3) shall be located at least 6 ft (1.8 m) from any LP-Gas container. (**58:**3-4.3.3)

30-3.3.2.3 Integral heater-container units specifically designed for the attachment of the heater to the container, or to a supporting standard attached to the container, shall be permitted to be used, provided they are designed and installed so as to prevent direct or radiant heat application to the container. Blower- and radiant-type units shall not be directed toward any LP-Gas container within 20 ft (6 m). (**58:**3-4.3.4)

30-3.3.2.4 If two or more heater-container units of either the integral or nonintegral type are located in an unpartitioned area on the same floor, the container(s) of each such unit shall be separated from the container(s) of any other such unit by at least 20 ft (6 m). (**58:**3-4.3.5)

30-3.3.2.5 If heaters are connected to containers manifolded together for use in an unpartitioned area on the same floor, the total water capacity of containers 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 m). (**58:**3-4.3.6)

30-3.3.2.6 On floors on which no heaters are connected for use, containers shall be permitted to be manifolded together for connection to a heater or heaters on another floor, provided

(a) The total water capacity of the containers connected to any one manifold is not greater than 2,450 lb (1111 kg) [nominal 1,000 lb (454 kg) LP-Gas capacity], and

(b) 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)

30-3.3.2.7 The provisions of 30-3.3.2.4, 30-3.3.2.5, and 30-3.3.2.6 shall be permitted to be altered by the authority having jurisdiction if compliance is impractical. (**58:**3-4.3.8)

30-3.3.3 Buildings Undergoing Minor Renovation When Frequented by the Public. Containers shall be permitted to be used and transported for repair or minor renovation in buildings frequented by the public as follows:

(a) During the hours of the day the public normally occupies the building, the following shall apply:

1. The maximum water capacity of individual containers shall be 50 lb (23 kg) [nominal 20 lb (9 kg) LP-Gas capacity], and the number of containers in the building shall not exceed the number of workers assigned to using the LP-Gas.

2. Containers having a water capacity greater than 2.7 lb (1.2 kg) and filled with no more than 16.8 oz (0.522 kg) LP-Gas shall not be left unattended.

(b) During the hours the building is not open to the public, containers shall be permitted to be used and transported within the building for repair or minor renovation in accordance with 30-3.3.1 and 30-3.3.2, provided that containers with a greater water capacity than 2.7 lb (1.2 kg) and filled with no more than 16.8 oz (0.522 kg) LP-Gas shall not be left unattended. (**58:**3-4.4)

30-3.3.4 Buildings Housing Industrial Occupancies.

30-3.3.4.1 Containers shall be permitted to be used in buildings housing industrial occupancies for processing, research, or experimental purposes as follows:

(a) Containers, equipment, and piping used shall comply with 30-3.3.1.

(b) If containers are manifolded together, the total water capacity of the connected containers 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 m).

(c) The amount of LP-Gas in containers for research and experimental use in the building shall be limited to the smallest practical quantity. (**58:**3-4.5.1)

30-3.3.4.2 Containers 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 containers and heaters comply with and are used in accordance with 30-3.3.2. (**58:**3-4.5.2)

30-3.3.5 Buildings Housing Educational and Institutional Occupancies. Containers 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:

(a) The maximum water capacity of individual containers used shall be as follows:

1. 50 lb (23 kg) [nominal 20 lb (9.1 kg) LP-Gas capacity] if used in educational occupancies.

2. 12 lb (5.4 kg) [nominal 5 lb (2 kg) LP-Gas capacity] if used in institutional occupancies.

(b) If more than one such container is located in the same room, the containers shall be separated by at least 20 ft (6.1 m).

(c) Containers not connected for use shall be stored in accordance with 30-5.

Exception: Containers shall not be stored in a laboratory room. (**58:**3-4.6)

30-3.3.6 Temporary Heating and Food Service Appliances in Buildings in Emergencies.

30-3.3.6.1 Containers 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 containers 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)

30-3.3.6.2 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 30-3.3.7.4 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)

30-3.3.7 Use in Buildings for Demonstrations or Training, or Use in Small Containers.

30-3.3.7.1 Containers 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 container is located in a room, the containers shall be separated by at least 20 ft (6.1 m). (**58:**3-4.8.1)

30-3.3.7.2 Containers 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:

(a) The maximum water capacity of individual containers 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 container.

(b) If more than one such container is located in the same room, the containers shall be separated by at least 20 ft (6.1 m).

(c) The training location shall be acceptable to the authority having jurisdiction.

(d) Containers shall be promptly removed from the building when the training class has terminated. (**58:**3-4.8.2)

30-3.3.7.3 Containers 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) and filled with no more than 16.8 oz (0.522 kg) of LP-Gas shall be permitted to be used in buildings as part of approved self-contained torch assemblies or similar appliances. (**58:**3-4.8.3)

30-3.3.7.4 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 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)

30-3.3.8 Portable Containers on Roofs or Exterior Balconies.

30-3.3.8.1 Containers 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 30-3.3.1 and the following:

(a) The total water capacity of containers 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) Containers 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) Containers shall not be located on roofs that are entirely enclosed by parapets more than 18 in. (457 mm) high unless

1. the parapets are breached with low-level ventilation openings no more than 20 ft (6.1 m) apart, or

2. 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 containers.

(e) The fire department shall be advised of each such installation. (**58:**3-4.9.1)

30-3.3.8.2 Containers having water capacities greater than $2^1/_2$ 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 container. (**58:**3-4.9.2)

30-3.4 Fire Protection.

30-3.4.1 General.

30-3.4.1.1 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 this section are sub-

ject to verification or modification through analysis of local conditions. (**58:**3-10.2.1)

30-3.4.1.2 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)

30-3.4.1.3 Fire protection shall be provided for installations having storage containers with an aggregate water capacity of more than 4,000 gal (15.1 m^3) subject to exposure from a single fire. The mode of such protection shall be determined through a competent fire safety analysis (*see 30-3.1.1.3*).

The first consideration in any such analysis shall be an evaluation of the total product control system including emergency internal and shutoff valves having remote and thermal shutoff capability and pullaway protection.

NOTE: Experience has indicated that hose stream application of water in adequate quantities as soon as possible after the initiation of flame contact is an effective way to prevent container failure from fire exposure. The majority of large containers exposed to sufficient fire to result in container failure have failed in from 10 to 30 min after the start of the fire where water was not applied. Water in the form of a spray can also be used to control unignited gas leakage.

Exception No. 1: If the analysis specified in 30-3.4.1.3 indicates a serious hazard does not exist, the fire protection provisions of 30-3.4.1.3 shall not apply.

Exception No. 2: If the analysis specified in 30-3.4.1.3indicates that a serious hazard exists and the provisions of 30-3.4.1.3cannot be met, special protection (see definition in NFPA 58) shall be provided in accordance with 30-3.4.2. (**58:**3-10.2.3)

30-3.4.1.4 Suitable roadways or other means of access for emergency equipment, such as fire department apparatus, shall be provided. (**58:**3-10.2.4)

30-3.4.1.5 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.*) (**58:**3-10.2.5)

30-3.4.1.6 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)

30-3.4.1.7 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)

30-3.4.2 Special Protection.

30-3.4.2.1 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)

30-3.4.2.2 If mounding is utilized, the provisions of 3-2.4.7 of NFPA 58 shall constitute adequate protection. (**58:**3-10.3.2)

30-3.4.2.3 If burial is utilized, the provisions of 3-2.4.8 of NFPA 58 shall constitute adequate protection. (**58:**3-10.3.3)

30-3.4.2.4 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)

30-3.4.2.5 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 also have a capability for manual actuation. (**58:**3-10.3.5)

30-4 LP-Gas Liquid Transfer.

30-4.1 Application. This section covers transfers of liquid LP-Gas from one container to another whenever 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, location of transfer operations, and methods for determining the quantity of LP-Gas permitted in containers. (**58:**4-1.1.1)

30-4.2 Operational Safety.

30-4.2.1 Transfer Personnel.

30-4.2.1.1 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)

30-4.2.1.2 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)

30-4.2.2 Containers to Be Filled.

30-4.2.2.1 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 58is found. (**58:**4-2.2.1)

NOTE: A TIA has been issued to NFPA 58 to add a new paragraph 4-2.2.2. See the last page of this document.

30-4.2.2.2 Valve outlets on portable containers 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 container is not connected for use.

Exception: Nonrefillable (disposable) and new unused containers shall not be required to comply. (**58:**4-2.2.2)

30-4.2.2.3 Containers shall be filled only after determination that they comply with the design, fabrication, inspection, marking, and requalification provisions of NFPA 58. (**58:**4-2.2.3)

30-4.2.2.4 DOT specification cylinders authorized as "single trip," "nonrefillable," or "disposable" containers shall not be refilled with LP-Gas. (**58:**4-2.2.4)

30-4.3 Arrangement and Operation of Transfer Systems.

30-4.3.1 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)

30-4.3.2 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 of NFPA 58 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)

30-4.3.3 Cargo vehicles (*see Section 30-6*) unloading into storage containers shall be at least 10 ft (3 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)

30-4.4 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 the LP-Gas between shutoff valves before disconnecting the liquid transfer line from the container. When 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 30-4.3.2.

Exception No. 6: Emergency venting as permitted in 30-4.3.3. (**58:**4-3.1)

30-5 Storage of Portable Containers Awaiting Use or Resale.

30-5.1 Application.

30-5.1.1 The provisions of this chapter are applicable to the storage of portable containers of 1,000 lb (454 kg) water capacity, or less, whether filled, partially filled, or empty (if they have been in LP-Gas service) as follows:

(a) At consumer sites or dispensing stations, where not connected for use.

(b) In storage for resale or exchange by dealer or reseller. (**58:**5-1.1.1)

30-5.1.2 The provisions of this section shall not apply to containers stored at bulk plants. (**58:**5-1.1.2)

30-5.2 General Provisions.

30-5.2.1 General Location of Containers.

30-5.2.1.1 Containers in storage shall be so located to minimize exposure to excessive temperature rise, physical damage, or tampering. (**58:**5-2.1.1)

30-5.2.1.2 Containers in storage having individual water capacity greater than $2^1/_2$ lb (1 kg) [nominal 1 lb (0.45 kg)] LP-Gas capacity, and filled with not more than 16.8 oz (0.522 kg) LP-Gas, shall be positioned such that the pressure relief valve is in direct communication with the vapor space of the container. (**58:**5-2.1.2)

30-5.2.1.3 Containers stored in buildings in accordance with 30-5.3 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)

30-5.2.1.4 Empty containers that have been in LP-Gas service shall preferably be stored outdoors. If stored indoors, they shall be considered as full containers for the purposes of determining the maximum quantities of LP-Gas permitted in 30-5.3.1, 30-5.3.2.1, and 30-5.3.3.1. (**58:**5-2.1.4)

30-5.2.1.5 Containers that are not connected for use shall not be stored on roofs. (**58:**5-2.1.5)

30-5.2.2 Protection of Valves on Containers in Storage. Container valves shall be protected as required by 2-2.4.1 of NFPA 58. Screw-on type caps or collars shall be securely in place on all containers stored, regardless of whether they are full, partially full, or empty, and container outlet valves shall be closed and plugged or capped. The provisions of 30-4.2.2.2 for valve outlet plugs and caps shall apply. (**58:**5-2.2.1)

30-5.3 Storage within Buildings.

30-5.3.1 Storage within Buildings Frequented by the Public. DOT specification cylinders with a maximum water capacity of $2^1/_2$ lb (1 kg) [nominal 1 lb (0.45 kg)] LP-Gas capacity, and filled with no more than 16.8 oz (0.522 kg) LP-Gas, 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-gr) butane nonrefillable containers shall be limited to no more than 24 containers.

Exception No. 2: An additional twenty-four 10-oz (283-gr) 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-hr fire wall protection. (**58:**5-3.1)

30-5.3.2 Storage within Buildings Not Frequented by the Public (Such as Industrial Buildings).

30-5.3.2.1 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 m). Storage beyond these limitations shall comply with 30-5.3.3. (**58:**5-3.2.1)

30-5.3.2.2 Containers carried as part of the service equipment on highway mobile vehicles shall not be considered in the total storage capacity in 30-5.3.2.1 provided such vehicles are stored in private garages and carry no more than three LP-Gas containers with a total aggregate capacity per vehicle not exceeding 100 lb (45 kg) of LP-Gas. Container valves shall be closed when not in use. (**58:**5-3.2.2)

30-5.3.3 Storage within Special Buildings or Rooms.

30-5.3.3.1 The maximum quantity of LP-Gas that may be stored in special buildings or rooms shall be 10,000 lb (4540 kg). (**58:**5-3.3.1)

30-5.3.3.2 Special buildings or rooms for storing LP-Gas containers 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)

30-5.3.3.3 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:

(a) 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.

(b) 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)

30-5.3.4 Storage within Residential Buildings. Storage of containers 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 2 containers 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 containers per each living space unit. Each container shall meet DOT specifications. (**58:**5-3.4)

30-5.4 Storage Outside of Buildings.

30-5.4.1 Location of Storage Outside of Buildings. Storage outside of buildings for containers awaiting use, exchange, or resale shall be located at least 5 ft (1.5 m) from any doorway in a building frequented by the public in accordance with Table 30-5.4.1 with respect to the following:

(a) The nearest important building or group of buildings.

(b) The line of adjoining property that can be built upon.

(c) Busy thoroughfares or sidewalks.

(d) The line of adjoining property occupied by schools, churches, hospitals, athletic fields, or other points of public gathering.

(e) A dispensing station.

Exception: Location of cylinders in the filling process shall not be considered to be in storage. (**58:**5-4.1)

Table 30-5.4.1

Quantity of LP-Gas Stored	Horizontal Distance to the following: (a) and (b)	(c) and (d)	(e)
720 lb (227 kg) or less	0	0	5 ft (1.5 m)
721 (227 + kg) to 2,500 lb (1134 kg)	0	10 ft (3 m)	10 ft (3 m)
2,501 (1134 + kg) to 6,000 lb (2721 kg)	10 ft (3 m)	10 ft (3 m)	10 ft (3 m)
6,001 (2721 + kg) to 10,000 lb (4540 kg)	20 ft (6 m)	20 ft (6 m)	20 ft (6 m)
Over 10,000 lb (4540 kg)	25 ft (7.6 m)	25 ft (7.6 m)	25 ft (7.6 m)

30-5.4.2 Protection of Containers.

30-5.4.2.1 Containers at a location open to the public shall be protected by either one of the following:

(a) An enclosure in accordance with 30-3.2.1(a), or

(b) A lockable ventilated metal locker or rack that prevents tampering with valves and pilferage of the cylinder. (**58:**5-4.2.1)

30-5.4.2.2 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)

30-5.4.3 Alternate Location and Protection of Storage. Where the provisions of 30-5.4.1 and 30-5.4.2.1 are impractical at construction sites, or at buildings or structures undergoing major renovation or repairs, the storage of containers shall be acceptable to the authority having jurisdiction. (**58:**5-4.3)

30-5.5 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. (**58:**5-5)

30-6 Vehicular Transportation of LP-Gas.

30-6.1 Transportation in Portable Containers.

30-6.1.1 Transportation of DOT Specification Cylinders or Portable ASME Containers.

30-6.1.1.1 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 30-6.1.1.2 through 30-6.1.1.7. (**58:**6-2.2.1)

30-6.1.1.2 Containers 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 portable containers. (**58:**6-2.2.2)

30-6.1.1.3 Valves of containers shall be protected in accordance with 30-2.1.6. Screw-on type protecting caps or collars shall be secured in place. The provisions of 30-4.2.2.2 shall apply. (**58:**6-2.2.4)

30-6.1.1.4 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 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 container, 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)

30-6.1.1.5 Containers and their appurtenances shall be determined to be leak-free before being loaded into vehicles. Containers shall be loaded into vehicles with substantially flat floors or equipped with suitable racks for holding containers. Containers shall be securely fastened in position to minimize the possibility of movement, tipping over, or physical damage. (**58:**6-2.2.6)

30-6.1.1.6 Containers having an individual water capacity not exceeding 108 lb (49 kg) [nominal 45 lb (20 kg) LP-Gas] capacity transported in open vehicles and containers 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. Containers having an individual water capacity exceeding 108 lb (49 kg) [nominal 45 lb (20 kg) LP-Gas] capacity transported in open vehicles and containers having an individual water capacity exceeding 10 lb (45 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)

30-6.1.1.7 Vehicles transporting more than 1,000 lb (454 kg) of LP-Gas, including the weight of the containers, shall be placarded as required by DOT regulations or state law. (**58:**6-2.2.8)

30-6.1.2 Fire Extinguishers. Each truck or trailer transporting portable containers as provided by 30-6.1.1 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. (*See also NFPA 10.*) (**58:**6-2.4)

30-6.2 Parking and Garaging Vehicles Used to Carry LP-Gas Cargo.

30-6.2.1 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 and those used to carry LP-Gas in cargo tanks. (**58:**6-6.1)

30-6.2.2 Parking of Vehicles.

30-6.2.2.1 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 in connection with their normal duties, nor shall this requirement prevent stops for meals or rest stops during the day or at night.

Exception No. 1: This shall not apply in an emergency.

Exception No. 2: Where parked in accordance with 30-6.2.2.1(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 m^3) 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)

30-6.2.2.2 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, piping, 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

1. The public is excluded from such buildings.

2. There is adequate 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 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)

30-6.2.2.3 Vehicles shall be permitted to be serviced or repaired indoors as follows:

(a) When it is necessary to take 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 30-6.2.2.2(a) or (c) shall apply.

(b) When it is necessary to take a vehicle carrying or containing LP-Gas into any public garage or repair facility for service on the engine or chassis, the provisions of 30-6.2.2.2(a) or (b) shall apply, unless the driver or a qualified representative of an LP-Gas operator is in attendance at all times when 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)

30-7 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.*

30-8 Liquified Natural Gas (LNG). The design, location, construction, and operation of LNG facilities shall be in accordance with NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG).*

Chapter 31 Fireworks Displays, Pyrotechnics before a Proximate Audience, Model and High Power Rocketry, Fireworks Manufacturing, and Rocketry Manufacturing

31-1 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.*

31-2 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; 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.

31-3 Fireworks Manufacturing. The manufacture, transportation, or storage of fireworks shall comply with NFPA 1124, *Code for the Manufacture, Transportation, and Storage of Fireworks.*

31-4 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.*

31-5 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.*

31-6 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.*

Chapter 32 Heating Appliances

32-1 General.

32-1.1 The installation of fuel-fired heating appliances shall comply with this chapter and NFPA 31, *Standard for the Installation of Oil-Burning Equipment.*

32-1.2 This chapter shall not apply to internal combustion engines, oil lamps, or portable devices not otherwise covered in this code or NFPA 31, such as blow torches, melting pots, and weed burners (**31:**1-1.3).

32-1.3 All oil-burning equipment shall be of the approved type.

32-1.4 See Section 1-15 for permits required.

32-1.5 Electrical wiring and equipment used in connection with oil-burning equipment shall be installed and maintained as specified in NFPA 70, *National Electrical Code.* (**31:**1-13.1)

32-1.6 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.

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 manufacturer's instructions and the terms of their listing. (**31:**1-15.1)

32-2 Kerosene Burners and Oil Stoves.

32-2.1 Kerosene 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.

32-2.2 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.

32-2.3 Only listed kerosene heaters shall be used. The following safeguards shall apply:

(a) Provide adequate ventilation.

(b) Do not place on carpeting.

(c) Keep 3 ft (0.9 m) away from combustible furnishings or drapes.

(d) Use only approved Type 1-K water clear kerosene.

(e) Allow to cool before refueling.

32-3 Portable Electric Heater.

32-3.1 Where allowed by this section portable heaters shall be designed and located so that they cannot be easily overturned. The authority having jurisdiction shall be permitted to prohibit use of portable heaters in occupancies or situations where such use or operation would present an undue danger to life or property.

32-3.2 All portable electric heaters shall be equipped to deenergize electric power to the unit when tilted or turned over.

32-4 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.*

Chapter 33 Spray Application Using Flammable or Combustible Materials

33-1 General.

33-1.1 Application.

33-1.1.1* Operations involving the spray application of flammable and combustible materials shall comply with this chapter and NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials.*

33-1.1.2 This chapter shall apply to locations or areas where flammable or combustible materials are applied by means of spray apparatus. This chapter outlines requirements to obtain reasonable safety when applying flammable and combustible finishes through the use of spray application methods and devices.

33-1.1.3 See Section 1-15 for permits required.

33-1.2 Special Definitions.

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:

(a) The interior of any spray booth or spray room, except as specifically provided for in Section 11-4 of NFPA 33; and

(b) The interior of any exhaust plenum and any exhaust duct leading from the spray process; and

(c) Any area in the direct path of a spray application process. (**33:**1-6)

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)

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)

33-2 Location of Spray Application Operations.

33-2.1 Spray application operations and processes shall be confined to spray booths, spray rooms, or spray areas, as defined in this Code. (**33:**2-1)

33-2.2 Locations in Other Occupancies. 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)

33-3 Spray Area.

33-3.1 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)

33-3.1.1 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)

33-3.1.2 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)

33-3.1.3 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)

33-3.1.4 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)

33-3.1.5 Spray booths that are used exclusively for powder coating shall meet the requirements of Chapter 13 of NFPA 33. 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)

33-3.2 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. (**33:**3-3)

33-3.2.1 Spray booths shall be installed so that all parts of the booth are readily accessible for cleaning. (**33:**3-3.1)

33-3.2.2 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)

33-3.3 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)

33-3.4 Spray areas that are equipped with ventilation distribution or baffle plates or with dry overspray collection filters shall meet the requirements of 33-3.4.1 through 33-3.4.5. (**33:**3-6)

33-3.4.1 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)

33-3.4.2 Filters shall not be used when applying materials known to be highly susceptible to spontaneous heating or spontaneous ignition. (**33:**3-6.2)

33-3.4.3 Supports and holders for filters shall be constructed of noncombustible materials. (**33:**3-6.3)

33-3.4.4 Overspray collection filters shall be readily removable or accessible for cleaning or replacement. (**33:**3-6.4)

33-3.4.5 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.*) (**33:**3-6.5)

33-4 Electrical and Other Sources of Ignition.

33-4.1 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 this section.

Exception No. 1: Powered vehicles shall meet the requirements of Section 3-4 of NFPA 33.

Exception No. 2: Resin application operations shall meet the requirements of Chapter 15 of NFPA 33. (**33:**4-1)

33-4.1.1 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)

33-4.1.2 Drying, curing, and fusing apparatus also shall meet the requirements of Chapter 11 of NFPA 33. (**33:**4-1.2)

33-4.1.3 Automobile undercoating operations also shall meet the requirements of Chapter 12 of NFPA 33. (**33:**4-1.3)

33-4.1.4 Powder coating apparatus also shall meet the requirements of Chapter 13 of NFPA 33. (**33:**4-1.4)

33-4.1.5 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)

33-4.1.6 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)

33-4.2 Electrical Devices in Spray Areas.

33-4.2.1 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)

33-4.2.2 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)

33-4.3 Electrical Devices Adjacent to Spray Areas. Electrical wiring and utilization equipment located adjacent to the spray area shall be classified in accordance with 33-4.3.1 through 33-4.3.5. (**33:**4-3)

33-4.3.1 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 4-3.1 of NFPA 33 shall be suitable for Class I, Division 2 or Class II, Division 2 locations, whichever is applicable. (**33:**4-3.1)

33-4.3.2 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 4-3.2(a) and 4-3.2(b) of NFPA 33 shall be suitable for Class I, Division 2 or Class II, Division 2 locations, whichever is applicable.

The Class I, Division 2 or Class II, Division 2 locations shown in Figures 4-3.2(a) and 4-3.2(b) of NFPA 33 shall extend from the edges of the open face or open front of the booth or room in accordance with the following:

(a) 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 4-3.2(a) of NFPA 33.

(b) 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 4-3.2(b) of NFPA 33.

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)

33-4.3.3 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)

33-4.3.4 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 4-3.4 of NFPA 33.*) (**33:**4-3.4)

33-4.3.5 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 4-3.5 of NFPA 33 for an example.*) (**33:**4-3.5)

33-4.4 Light Fixtures.

33-4.4.1 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 Section 3-5 of NFPA 33 shall be suitable for use in ordinary hazard (general purpose) locations. (*See Figure 4-4.1 of NFPA 33.*) Such fixtures shall be serviced from outside the spray area. (**33:**4-4.1)

33-4.4.2 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 Section 3-5 of NFPA 33 shall be suitable for use in that location. Such fixtures shall be serviced from outside the spray area. (*See Figure 4-4.1 of NFPA 33.*) (**33:**4-4.2)

33-4.4.3 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 4-4.3 of NFPA 33.*) (**33:**4-4.3)

33-4.4.4 Light fixtures that are located inside the spray area shall meet the requirements of Sections 4-2 and 4-5 of NFPA 33. (**33:**4-4.4)

33-4.5 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. (NFPA 77, *Recommended Practice on Static Electricity*, contains information about grounding for static electric charge.) (**33:**4-5)

33-4.6 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:

(a) They are approved for extra-hard usage;

(b) They are equipped with a grounding conductor that meets the requirements of Section 400-2 of NFPA 70, *National Electrical Code*;

(c) They are connected to terminals or conductors in an approved manner;

(d) 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;

(e) They are provided with explosionproof seals where the cord enters junction boxes, fittings, or enclosures;

(f) They are listed for deposits of combustible residues. (**33:**4-6)

33-4.7 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 33-4.2.2. (**33:**4-7)

33-5 Ventilation.

33-5.1 General. 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 Materials*, except as amended by the requirements of Chapter 5 of NFPA 33. (**33:**5-1)

33-5.2 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)

33-5.2.1 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)

33-5.2.2 Powder coating systems also shall meet the requirements of Section 13-6 of NFPA 33. (**33:**5-2.2)

33-5.2.3 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)

33-5.3 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)*

33-5.4 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)

33-5.5 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)

33-5.6 Belts shall not enter any spray area unless the belt and pulley within the spray area is completely enclosed. (**33:**5-10.3)

33-6 Flammable and Combustible Liquids Storage, Handling, and Distribution.

33-6.1 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 this section. (**33:**6-1)

33-6.2 Storage.

33-6.2.1 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)

33-6.2.2 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 (a) or (b), whichever is greater:

(a) A supply for one day, or

(b) 25 gal (95 L) of Class IA liquids in containers, plus 120 gal (454 L) of Class IB, IC, II, or III liquids in containers, plus

Two portable tanks each not exceeding 660 gal (2498 L) of Class IB, IC, Class II, or Class IIIA liquids, plus

Twenty portable tanks each not exceeding 660 gal (2498 L) of Class IIIB liquids. (**33:**6-2.2)

33-6.2.3 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 33-6.3. (**33:**6-2.3)

33-6.3 Mixing.

33-6.3.1 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 6-3.2 of NFPA 33.*) (**33:**6-3.1)

33-6.3.2 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 33-6.3.2.1 through 33-6.3.2.6. (*See Figure 6-3.2 of NFPA 33 for an example of this arrangement.*) (**33:**6-3.2)

33-6.3.2.1 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 6-3.2.1(a), 6-3.2.1(b), and 6-3.2.1(c) of NFPA 33 for examples.*] (**33:**6-3.2.1)

33-6.3.2.2 Construction shall meet the requirements of Section 33-3.1, 33-3.1.1, and 33-3.1.2. (**33:**6-3.2.2)

33-6.3.2.3 The room shall be designed to contain a liquid spill. (**33:**6-3.2.3)

33-6.3.2.4 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)

33-6.3.2.5 An approved automatic fire extinguishing system that meets the requirements of Chapter 7 of NFPA 33 shall be provided. (**33:**6-3.2.5)

33-6.3.2.6 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)

33-6.4 Distribution Systems—General.

33-6.4.1 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)

33-6.4.2 Wherever liquids are transferred from one container to another, both containers shall be effectively bonded and grounded to dissipate static electricity. (NFPA 77, *Recommended Practice on Static Electricity*, provides information on static protection.) (**33:**6-5.2)

33-6.4.3 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)

33-7 Fire Protection Equipment Required.

33-7.1 Spray areas and mixing rooms shall be protected with an approved automatic fire extinguishing system. (**33:**7-1)

33-7.1.1 For continuous spray application operations, activation of the fire extinguishing system shall automatically accomplish all of the following:

(a) Activate a local alarm in the vicinity of the spraying operation and activate the facility's alarm system, if such a system is provided,

(b) Shut down the coating material delivery system,

(c) Terminate all spray application operations,

(d) Stop any conveyors into and out of the spray area.

(*See Sections 33-7.7 and 33-7.8 for additional requirements for fixed powder application systems and fixed liquid electrostatic application systems.*) (**33:**7-1.1)

33-7.1.2 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 33-7.1.1 (a) through (d). 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)

33-7.1.3 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 33-7.7 shall be met instead of 33-7.1.3. (**33:**7-1.3)

33-7.2 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)

33-7.3 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 Sprinkler Systems.* (**33:**7-2.3)

33-7.4 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)

33-7.5 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)

33-7.6 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)

33-7.7 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:

(a) Shut down all energy supplies (electrical and compressed air) to conveyor, ventilation, application, transfer, and powder collection equipment;

(b) Close segregation dampers in associated ductwork to interrupt airflows from application equipment to powder collectors;

(c) Activate an alarm. (**33:**7-5)

33-7.8 Protection for Automated Liquid Electrostatic Spray Application Equipment. 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:

(a) Meet all of the requirements of 33-7.1.1,

(b) Disconnect power to the high voltage elements in the spray area and de-energize the system. (**33:**7-6)

33-8 Operations and Maintenance.

33-8.1 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. Proper maintenance shall be the responsibility of the users of the apparatus and processes. (**33:**8-1)

33-8.2 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)

33-8.3 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)

33-8.4 Maintenance Procedures.

33-8.4.1 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)

33-8.4.2 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)

33-8.5 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)

33-8.6 Employees' clothing contaminated with sprayed material shall not be left on the premises overnight unless kept in metal lockers. (**33:**8-6)

33-8.7 Cleaning Solvents.

33-8.7.1 Solvents for cleaning operations shall have flash points above 100°F (37.8°C). (**33:**8-7.1)

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.

33-8.7.2 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 Chapter 4 of NFPA 33. (**33:**8-7.2)

33-8.8 "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)

33-8.9 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)

33-9 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)

33-9.1 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)

33-9.2 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)

33-9.3 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)

33-9.4 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)

Chapter 34 Welding, Cutting, and Use of Torches

34-1 General.

34-1.1 Welding, cutting, and use of torches shall comply with this chapter and NFPA 51B, *Standard for Fire Prevention in Use of Cutting and Welding Processes.*

34-1.2 Acetylene cylinder charging plants shall comply with NFPA 51A, *Standard for Acetylene Cylinder Charging Plants.*

34-2 Fire Prevention Precautions.

34-2.1 Permissible Areas. Cutting or welding shall be permitted only in areas that are or have been made fire safe (*see Section 3-2 of NFPA 51B*). Within the confines of an operating plant or building, the cutting and welding work area shall be either (1) a specific area designed or approved for such work, such as a maintenance shop or a detached outside location that shall be of noncombustible or fire-resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas; or (2) where work cannot be moved practically, as in most construction work, an area made fire safe by removing combustibles or protecting combustibles from ignition sources. (**51B:**3-1)

34-2.1.1 Cutting or welding shall not be permitted

(a) In areas not authorized by management.

(b) In sprinklered buildings while such protection is impaired.

(c) In the presence of explosive atmospheres (e.g., mixtures of flammable gases, vapors, liquids, or dusts with air) or explosive atmospheres that can develop inside uncleaned or improperly prepared drums, tanks, or other containers and equipment that have previously contained such materials or that can develop in areas with an accumulation of combustible dusts.

NOTE: 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 AWS F-4.1, *Recommended Safe Prac-*

tices for the Preparation for Welding and Cutting of Containers and Piping.

(d) In areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulfur, baled paper, or cotton. (**51B**:3-1.1)

34-2.2 Permit.

34-2.2.1 See Section 1-15 for permits required.

34-2.2.2 Before cutting or welding is permitted and at least once per day while the permit is in effect, the area shall be inspected by the individual responsible for authorizing cutting and welding operations [*see Section 2-1(b) of NFPA 51B*] to ensure that it is a fire safe area. This individual shall designate precautions to be followed in granting authorization to proceed in the form of a written permit or other equivalent means. This individual shall sign the permit or otherwise authorize the work and shall verify the following: (**51B:**3-2)

34-2.2.2.1 Cutting and welding equipment to be used shall be in satisfactory operating condition and in good repair. (**51B:**3-2.1)

34-2.2.2.2 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 or concrete) shall be kept wet, covered with damp sand, or protected by fire-resistant shields. Where floors have been wet down, personnel operating arc welding or cutting equipment shall be protected from possible shock. (**51B:**3-2.2)

34-2.2.2.3 All combustibles shall be relocated at least 35 ft (11 m) horizontally from the work site. Where relocation is impractical, combustibles shall be protected with flameproofed covers or otherwise shielded with metal or fire-resistant guards or curtains. Edges of covers at the floor shall be tight to prevent sparks from going under them. This precaution is also important at overlaps where several covers are used to protect a large pile. (**51B:**3-2.3)

34-2.2.2.4 Openings or cracks in walls, floors, or ducts within 35 ft (11 m) of the site shall be tightly covered to prevent the passage of sparks to adjacent areas. (**51B:**3-2.4)

34-2.2.2.5 Conveyor systems that might carry sparks to distant combustibles shall be protected. (**51B:**3-2.5)

34-2.2.2.6 Where cutting or welding is done near walls, partitions, ceilings, or roofs of combustible construction, fire-resistant shields or guards shall be provided to prevent ignition. If welding is to be done on a metal wall, partition, ceiling, or roof, precautions shall be taken to prevent ignition of combustibles on the other side, due to conduction or radiation, preferably by relocating combustibles. Where combustibles are not relocated, a fire watch on the opposite side from the work shall be provided. Welding shall not be attempted on a metal partition, wall, ceiling, or roof having a combustible covering, nor on walls or partitions of combustible sandwich-type panel construction. (**51B:**3-2.6)

34-2.2.2.7 Cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings, or roofs shall not be undertaken if the work is close enough to cause ignition by conduction. (**51B:**3-2.7)

34-2.2.2.8 Fully charged and operable fire extinguishers, appropriate for the type of possible fire, shall be available at the work area. Where hose lines are available, they shall be connected and ready for service. (**51B:**3-2.8)

34-2.2.2.9 Where welding or cutting 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. Special precautions shall be taken to avoid accidental operation of automatic fire detection or suppression systems (e.g., special extinguishing systems). (**51B:**3-2.9)

34-2.2.2.10 Nearby personnel shall be suitably protected against heat, sparks, slag, etc. (**51B:**3-2.10)

34-2.3 Fire Watchers.

34-2.3.1 Fire watchers shall be required by the individual responsible for authorizing cutting and welding wherever cutting or welding is performed in locations where other than a minor fire might develop, or any of the following conditions exist:

(a) Appreciable combustible material in building construction or contents is closer than 35 ft (11 m) to the point of operation.

(b) Appreciable combustibles are more than 35 ft (11 m) away but are easily ignited by sparks.

(c) Wall or floor openings within a 35-ft (11-m) radius expose combustible material in adjacent areas, including concealed spaces in walls or floors.

(d) Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation. (**51B:**3-3)

34-2.3.2 Fire watchers shall have fire extinguishing equipment readily available and be trained in its use, including practice on test fires. (**51B:**3-3.1)

34-2.3.3 Fire watchers shall be familiar with facilities and procedures for sounding an alarm in the event of a fire. (**51B:**3-3.2)

34-2.3.4 Fire watchers shall watch for fires in all exposed areas, and try to extinguish them first only when obviously within the capacity of the equipment available, or otherwise sound the alarm immediately. (**51B:**3-3.3)

34-2.3.5 A fire watch shall be maintained for at least a half hour after completion of cutting or welding operations to detect and extinguish smoldering fires. (**51B:**3-3.4)

34-3 Oxygen-Fuel Gas Systems.

34-3.1 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.*

34-3.2 Cylinders and Containers.

34-3.2.1 Design and Construction. 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 VesselCode.* (**51:**2-1.1)

34-3.2.2* 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 ANSI/CGA-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)

34-3.2.3 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)

34-3.2.4 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 m^3/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)

34-3.2.5 Permits shall be required for cylinder and container storage and the storage of calcium carbide within this jurisdiction.

34-3.2.6 Cylinders shall be secured in a manner so as to not be easily overturned.

34-3.2.7 Calcium carbide shall be stored in packages meeting DOT or TC regulations. (**51:**7-1.1)

34-3.3 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:

(a) 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.

(b) Provide shielding, wetting, or other approved means to protect combustible material in close proximity of the flame. Approved stored pressure water fire extinguisher shall not be used to wet combustible material.

(c) 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 will result from the work that was completed. This person's responsibilities shall include detecting and reporting any fire.

Chapter 35 Dust Explosion Prevention

35-1 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 maintained in accordance with the applicable standards listed below.

NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Products Facilities.*

NFPA 65, *Standard for the Processing and Finishing of Aluminum.*

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 Solid 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 Materials.*

NFPA 651, *Standard for the Manufacture of Aluminum Powder.*

NFPA 654, *Standard for the Prevention of Fire and Dust Explosions in the Chemical, Dye, Pharmaceutical, and Plastics Industries.*

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.*

35-2 Special Definitions.

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 or deflagration hazard.

Combustible Particulate Solid. Any combustible solid material comprised of distinct particles or pieces, regardless of size, shape, or chemical composition that generate combustible dusts during handling. Combustibule particulate solids include dusts, fibers, fines, chips, chunks, flakes, or mixtures of these.

35-3 Permit Required. See Section 1-15 for permits required.

Chapter 36 Industrial Ovens and Furnaces

36-1 General.

36-1.1 Application. Industrial ovens and furnaces shall comply with this chapter and 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*, as applicable.

36-1.2 Permits.

36-1.2.1 See Section 1-15 for permits required.

36-1.2.2 Applications for a permit shall be accompanied by plans showing all essential details and calculations for safe operation.

36-2 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.

36-3 Safety Controls. Safety controls, as specified in NFPA 86, 86C, and 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 37 Mechanical Refrigeration

37-1 General.

37-1.1 This chapter shall apply to all refrigerating units or systems described herein.

Exception: Air, water, or brine systems and all units utilizing Group 1 refrigerants with a refrigerant compressor or horsepower rating of less than 100.

37-2 Classifications.

37-2.1 Group 1.

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)

37-2.2 Group 2.

Ammonia (R-717)
Dichloroethylene (R-1130)
Methyl Chloride (R-40)
Methyl Formate (R-611)
Sulfur Dioxide (R-764)

37-2.3 Group 3.

Butane (R-600)
Ethane (R-170)
Propane (R-290)
Ethylene (R-1150)
Isobutane (R-600a)

37-3 Maintenance and Installation.

37-3.1 All refrigeration systems shall be maintained free from accumulations of oil, dirt, waste, and other debris and shall be maintained accessible at all times.

37-3.2 All new mechanical refrigeration systems shall be installed, and all existing installations shall be maintained in a standard safe manner that will minimize life, health, and fire hazards of the installation.

37-3.3 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.

37-3.4 All refrigeration systems requiring a permit shall be provided with an easily legible (i.e., manufacturer's nameplate) sign permanently attached and easily accessible, indicating the name and address of the manufacturer or installer, the kind and total number of pounds of refrigerant contained in the system, and the field test pressure applied.

37-3.5 All systems containing more than 100 lb (45 kg) of refrigerant shall be provided with signs having letters not less than $^1/_2$ in. (12.5 mm) high designating the main shutoff valves to each vessel, main stream or electrical control, remote control switch, and pressure limiting device.

37-4* 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 38 Explosive Materials and Ammonium Nitrate

38-1 Application. 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.*

38-2 Storage. 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.*

Chapter 39 Combustible Fibers

39-1 Application.

39-1.1 All facilities handling or storing combustible fibers shall comply with this chapter.

39-1.2 This chapter shall not apply to buildings completely protected by an approved automatic fire extinguishing system; however, this does not obviate the need for good housekeeping.

39-1.3 Special Definition.

Loose House. A separate detached building in which unbaled combustible fibers are stored.

39-2 Loose Storage of Combustible Fibers.

39-2.1 Loose combustible fibers (not in suitable bales or packages), whether housed or in the open, shall not be stored within 100 ft (30.5 m) of any building, except as hereinafter specified.

39-2.2 Quantities of loose combustible fibers up to 100 ft^3 (2.832 m^3) shall not be kept in any building unless stored in a metal or metal-lined bin equipped with a self-closing cover.

39-2.3 Quantities exceeding 100 ft^3 (2.832 m^3) of loose combustible fibers, but not exceeding 500 ft^3 (14.16 m^3), 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 one hour. Each opening into such rooms or compartments from other parts of the building shall be equipped with an approved self-closing fire door.

39-2.4 Quantities exceeding 500 ft^3 (14.16 m^3) of loose combustible fibers shall be permitted to be stored in approved vaults, constructed as follows:

(a) Storage vaults shall be located outside of buildings or, if located inside, shall be provided with approved safety vents to the outside.

(b) Walls, floors, and ceilings shall be constructed of approved noncombustible material having a fire resistance rating of not less than one hour. Roofs of outside vaults shall be of noncombustible material, but can be so constructed as to readily give way in case of an internal explosion.

(c) 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 cutoff) shall be protected by approved fire doors.

(d) Vaults located within buildings and exceeding 1,000 ft^3 (28.32 m^3) storage capacity shall be protected by an approved automatic fire extinguishing system.

39-2.5 Not more than 2,500 ft^3 (70.8 m^3) of loose fibers shall be permitted to be stored in a detached loose house suitably located, with openings properly protected against entrance of sparks. The loose house shall be used for no other purpose.

39-3 Baled Storage.

39-3.1 No single block or pile shall contain more than 25,000 ft^3(708 m^3) 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 (1.53 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 (0.61 m) beyond the top of the piles.

39-3.2 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 allowing for expansion in any direction without endangering building walls, ceilings, or columns. Not less than 3 ft (0.914 m) clearance shall be left between walls and sides of piles, except that in storage compartments not more than 30 ft (9.14 m) in width, 1 ft (0.305 m) clearance at side walls shall be sufficient, provided a center aisle not less than 5 ft (1.53 m) wide is maintained.

39-3.3 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.

39-3.4 Combustible fibers shall not be stored in rooms or buildings with hazardous gases, flammable liquids, dangerous chemicals, or other similar materials.

39-4 Sources of Ignition.

39-4.1 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, Maintenance, and Operation*, shall not enter any fiber storage room or building, but shall be permitted to be used at loading platforms.

39-4.2 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.

39-4.3 No smoking or open flame shall be permitted in any area where combustible fibers are handled or stored, nor within 50 ft (15.25 m) of any uncovered pile of such fibers. "NO SMOKING" signs shall be posted.

39-5 Portable Extinguishers.

39-5.1 Portable fire extinguishers shall be installed as required for extra hazard occupancy protection as applicable in NFPA 10, *Standard for Portable Fire Extinguishers.*

39-5.2 See Section 1-15 for permits required.

Chapter 40 Refueling

40-1 Aircraft Fuel Servicing.

40-1.1 General.

40-1.1.1 Application.

40-1.1.1.1 Aircraft fuel servicing shall comply with this section and NFPA 407, *Standard for Aircraft Fuel Servicing.*

40-1.1.1.2 This section applies to the ground fuel servicing of all types of aircraft with liquid petroleum fuel. It does not apply to the following:

(a) In-flight fueling;

(b) Fuel servicing of flying boats or amphibious aircraft on water; or

(c) Draining or filling of aircraft fuel tanks incidental to aircraft fuel system maintenance operations or manufacturing. (**407:**1-1)

40-1.1.2 Fuel Servicing Personnel. Only authorized personnel trained in the safe operation of the equipment they use, in the operation of emergency controls, and in procedures to be followed in an emergency shall fuel or defuel aircraft. (**407:**3-1.1)

40-1.1.3 Prevention and Control of Spills.

40-1.1.3.1 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)

40-1.1.3.2 Fuel nozzles shall not be dragged along the ground. (**407:**3-2.2)

40-1.1.3.3 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)

40-1.1.4 Bonding.

40-1.1.4.1 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)

40-1.1.4.2 In addition to the above, when 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 of 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)

40-1.1.4.3 When 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)

40-1.1.4.4 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)

40-1.1.4.5 Bonding and fueling connections shall be disconnected in the reverse order of connection. (**407:**3-4.5)

40-1.1.4.6 Conductive hose shall be used to prevent electrostatic discharge but shall not be used to accomplish required bonding. (**407:**3-4.6)

40-1.1.5 Operation of Aircraft Engines, Auxiliary Power Units, and Heaters.

40-1.1.5.1 Fuel servicing shall not be performed on a fixed wing aircraft while an onboard engine is operating.

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)

40-1.1.5.2 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)

40-1.1.6 Internal Combustion Engine Equipment Around Aircraft (Other than Aircraft Fuel Servicing Vehicles).

40-1.1.6.1 Equipment, other than those performing aircraft servicing functions, shall not be permitted within 50 ft (15 m) of aircraft during fuel servicing operations. (**407:**3-6.1)

40-1.1.6.2 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)

40-1.1.6.3 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)

40-1.1.7 Open Flames.

40-1.1.7.1 Entrances to fueling areas shall be posted with "NO SMOKING" signs. (**407:**3-8.1)

40-1.1.7.2 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)

40-1.1.7.3 The category of open flames and lighted open-flame devices shall include, but not be limited to, thefollowing:

(a) Lighted cigarettes, cigars, pipes;

(b) Exposed flame heaters, liquid, solid, or gaseous devices, including portable and wheeled gasoline or kerosene heaters;

(c) Heat-producing, welding or cutting devices, and blowtorches;

(d) Flare pots or other open-flame lights. (**407:**3-8.3)

40-1.1.7.4 Personnel shall not carry lighters or matches on their person while engaged in fuel servicing operations. (**407:**3-8.5)

40-1.1.7.5 Lighters or matches shall not be permitted on or in fueling equipment. (**407:**3-8.6)

40-1.1.7.6 The authority having jurisdiction might establish other locations where open flames and open-flame devices shall not be permitted. (**407:**3-8.4)

40-1.1.8 Aircraft Fuel Servicing Locations.

40-1.1.8.1 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)

40-1.1.8.2 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)

40-1.1.8.3 Accessibility to aircraft by emergency fire equipment shall be established for aircraft fuel servicing positions. (**407:**3-10.3)

40-1.2 Airport Fueling Systems.

40-1.2.1 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)

40-1.2.2 Acceptance Inspection. The authority having jurisdiction shall inspect and approve the completed system before it is put into service. (**407:**2-4.2)

40-1.2.3 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 structures 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)

40-1.3 Aircraft Fueling Ramp Drainage.

40-1.3.1 Application. Aircraft fueling ramp drainage shall comply with this section and NFPA 415, *Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways.*

40-1.3.2 Design.

40-1.3.2.1 Aircraft fueling ramps shall slope away from terminal buildings, aircraft hangars, aircraft loading walkways, or other structures, with a minimum grade of one percent (1:100) for the first 50 ft (15.2 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)

40-1.3.2.2 Aircraft fueling ramp drainage as specified herein shall be accomplished by the provisions of 40-1.3.2.1 in conjunction with the following:

(a) Use of drain inlets with connected piping.

(b) Use of open grate trenches. (**415:**3-1.2)