NFPA 32

Standard for Drycleaning Plants

2007 Edition

NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
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NFPA 32

Standard for

Drycleaning Plants

2007 Edition

This edition of NFPA 32, *Standard for Drycleaning Plants*, was prepared by the Technical Committee on Textile and Garment Care Processes. It was issued by the Standards Council on July 28, 2006, with an effective date of August 17, 2006, and supersedes all previous editions.

This edition of NFPA 32 was approved as an American National Standard on August 17, 2006.

Origin and Development of NFPA 32

This standard was originally prepared by the Committee on Flammable Liquids in 1924 and 1925 in cooperation with the National Association of Dryers and Cleaners. The first edition was adopted in 1925. Amendments were adopted in 1927; completely revised editions were issued in 1936, 1944, and 1956; amendments were adopted in 1964; a completely revised edition was issued in 1970; amendments were adopted in 1972; and completely revised editions were issued in 1974 and 1979. There was a minor amendment in the 1985 edition, which was reconfirmed in 1990, and minor changes were adopted for the 1996 edition.

For the 2000 edition, general requirements for all plants, regardless of solvent in use, were moved to the front of the standard. There was better correlation of the requirements for each plant type with the relative hazards potentially present. Various protection requirements were made less stringent in cases where a plant has reduced quantities of solvent in combination with various redundant safety systems for the equipment. Requirements were added to address machine conversion to allow a machine to use another solvent, as is commonly occurring in the industry.

For the 2004 edition, additional guidance and definitions were added to better define and explain machine conversions made to allow for use of a different class of solvent.

For the 2007 edition, new options have been added to allow for increasing the maximum concentration to 60 percent or below of the LEL with adequate automatic instrumentation and safety interlocks in accordance with NFPA 69, *Standard on Explosion Prevention Systems*. Also, new requirements have been added for drycleaning using nonflammable liquefied gases in pressure vessels including, but not limited to, carbon dioxide solvent technologies. A small chapter was added for new requirements for laundry equipment in drycleaning plants.

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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 concerned with the fire and explosion hazards of drycleaning using combustible and noncombustible solvents and the fire hazards of laundries and other textile care processes.

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Standard for

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

Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet (•) between the paragraphs that remain.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex C. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex C.

Chapter 1 Administration

1.1 Scope. This standard shall apply to establishments hereinafter defined as drycleaning plants.

1.2 Purpose.

1.2.1 This standard prescribes safeguards intended to prevent fires and explosions involving drycleaning processes and to minimize the personal injury and property damage consequences of such incidents.

1.2.2 This standard does not include requirements for disposal of any hazardous chemicals or materials.

1.2.3 Requirements not specifically mentioned or referred to herein are not part of this standard.

1.3 Retroactivity. The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

1.3.1 Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

1.3.2 In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

1.3.3 The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction and only where it is clearly evident that a reasonable degree of safety is provided.

1.4 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

1.4.1 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.4.2 The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

1.5 Enforcement.

1.5.1 Before any drycleaning plant is established or constructed, the class of solvent is changed, or an existing plant is remodeled, plans and specifications shall be submitted to the authority having jurisdiction for examination and approval.

1.5.2 Plans shall be drawn to an indicated scale showing the relative location of the drycleaning building; boiler room; finishing building or departments; items such as storage tanks for solvents, pumps, washers, drying tumblers, filters, stills, processing tanks, and interconnecting piping; and the sectional elevation of the buildings, including the lowest floors, pits, tanks and the fittings, and other services.

1.6* Flash Point and Flammability Limits.

1.6.1 The flash point of a solvent shall be tested in accordance with NFPA 30, *Flammable and Combustible Liquids Code.*

1.6.2 The solvent supplier is responsible for certifying the flash point of the solvent under the anticipated conditions of operation.

1.6.3 The solvent supplier is responsible for certifying the flammability limits [lower explosive limit (LEL) and upper explosive limit (UEL)] of the solvent under the anticipated conditions of operations.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers,* 2007 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems,* 2005 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2007 edition.

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NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2002 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* 2003 edition.

NFPA 55, *Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks,* 2005 edition.

NFPA 69, *Standard on Explosion Prevention Systems,* 2002 edition.

NFPA 70, *National Electrical Code®,* 2005 edition.

NFPA 79, *Electrical Standard for Industrial Machinery,* 2007 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems,* 2002 edition.

NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids,* 2004 edition.

NFPA *101®*, *Life Safety Code®,* 2006 edition.

NFPA 326, *Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair,* 2005 edition.

NFPA 750, *Standard on Water Mist Fire Protection Systems,* 2006 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems,* 2004 edition.

NFPA 5000®, *Building Construction and Safety Code®,* 2006 edition.

2.3 Other Publications.

2.3.1 ASME Publications. American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

ASME *Boiler and Pressure Vessel Code*, 2001.

ANSI/ASME B31.1, *Power Piping*, 2004.

2.3.2 ASTM Publications. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 323, *Standard Method of Test for Vapor Pressure of Petroleum Products (Reid Method)*, 1999.

2.3.3 Other Publications. *Merriam-Webster's Collegiate Dictionary*, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 30, *Flammable and Combustible Liquids Code,* 2003 edition.

NFPA 58, *Liquefied Petroleum Gas Code,* 2004 edition.

NFPA 70, *National Electrical Code®,* 2005 edition.

NFPA 99, *Standard for Health Care Facilities,* 2005 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 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.

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

3.2.5 Shall. Indicates a mandatory requirement.

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

3.2.7 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 or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions.

3.3.1 Bonding. The permanent joining of metallic parts to form an electrically conductive path that ensures electrical continuity and the capacity to conduct safely any current likely to be imposed. [**70,** 2005]

3.3.2* Combustible Liquid. Any liquid that has a closed-cup flash point at or above 100°F (37.8°C). Combustible liquids shall be classified as Class II or Class III as follows: Class II Liquid. Any liquid that has a flash point at or above 100°F (37.8°C) and below 140°F (60°C). Class IIIA. Any liquid that has a flash point at or above 140°F (60°C), but below 200°F (93°C). Class IIIB. Any liquid that has a flash point at or above 200°F (93°C).[**30,** 2003]

3.3.3 Conversion. Any modification(s) made to a new, existing, or used drycleaning machine, drying tumbler, or reclaiming tumbler that allows the use of a solvent of a different class as specified on the original manufacturers' nameplate. *(See Annex B, Guidance on Conversions.)*

3.3.4* Drycleaning. The process of removing dirt, grease, paints, and other stains from such items as wearing apparel, textiles, fabrics, and rugs by the use of nonaqueous liquids (solvents, nonwater based).

3.3.5 Drycleaning Machines. Any equipment in which textiles are immersed or agitated in solvent or in which drycleaning solvent is extracted from textiles and/or dried.

3.3.6* Drycleaning Plant. A plant in which drycleaning and associated operations are conducted, including the office, receiving area, and storage rooms.

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3.3.7 Drycleaning Room. A room in which the drycleaning operations are conducted, including all additional areas containing solvent or solvent-handling equipment.

3.3.8 Dual-Phase Processing. A process in which a drycleaning operation precedes or follows a laundering operation in the same equipment.

3.3.9* Flammable Liquid. Any liquid that has a closed-cup flash point below 100°F (37.8°C), as determined by the test procedures and apparatus set forth in 1.7.4 of NFPA 30. Flammable liquids are classified as Class I as follows: *Class I Liquid* — any liquid that has a closed-cup flash point below 100°F (37.8°C) and a Reid vapor pressure not exceeding 40 psia (2068.6 mm Hg) at 100°F (37.8°C), as determined by ASTM D 323, *Standard Method of Test for Vapor Pressure of Petroleum Products (Reid Method)*. Class I liquids are further classified as follows: (1) Class IA liquids — those liquids that have flash points below 73°F (22.8°C) and boiling points below 100°F (37.8°C); (2) Class IB liquids — those liquids that have flash points below 73°F (22.8°C) and boiling points at or above 100°F (37.8°C); (3) Class IC liquids — those liquids that have flash points at or above 73°F (22.8°C), but below 100°F (37.8°C). [**30,** 2003]

3.3.10* Flash Point. The minimum temperature of a liquid at which sufficient vapor is given off to form an ignitible mixture with the air, near the surface of the liquid or within the vessel used, as determined by the appropriate test procedure and apparatus specified in 1.7.4 of NFPA 30. [**30,** 2003]

3.3.11 Gallon. U.S. Standard. 1 U.S. gal = 0.833 Imperial gal = 231 $in.^3$ = 3.785 L. [**58,** 2004]

3.3.12 Grounded. Connected to earth or to some conducting body that serves in place of the earth. [**70,** 2005]

3.3.13 Intrinsically Safe. As applied to equipment and wiring, equipment and wiring that are incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture. [**99,** 2005]

3.3.14 Remanufactured. See 3.3.3, Conversion.

3.3.15 Retrofit. See 3.3.3, Conversion.

3.3.16 Solvents.

3.3.16.1 ***Class I Solvents.*** Liquids having a flash point below 37.8°C (100°F).

3.3.16.2 ***Class II Solvents.*** Liquids having a flash point at or above 38°C (100°F) and below 60°C (140°F).

3.3.16.3 ***Class IIIA Solvents.*** Liquids having a flash point at or above 60°C (140°F) and below 93.4°C (200°F).

3.3.16.4 ***Class IIIB Solvents.*** Liquids having a flash point at or above 93.4°C (200°F).

3.3.16.5 ***Class IV Solvents.*** Liquids classified as nonflammable.

3.3.17 Spotting (Prespotting). The local application of a solvent to spots of dirt, grease, paint, tar, and other stains for removal of same.

3.3.18 Still. An appliance that distills a solvent to remove contaminants and recover the solvent in the drycleaning process.

3.3.19 Systems.

3.3.19.1 ***Type I.*** Systems employing Class I solvents are prohibited by this standard per 4.2.1.1 [e.g., 50°F (10°C) flash point naphtha].

3.3.19.2 ***Type II.*** Systems employing Class II solvents and complying with the requirements of Chapters 4, 5, 6, and 7 (e.g., Stoddard solvent).

3.3.19.3 ***Type IIIA.*** Systems employing Class IIIA solvents and complying with the requirements of Chapters 4, 5, 6, and 8 [e.g., 140°F (60°C) solvent].

3.3.19.4 ***Type IIIB.*** Systems employing Class IIIB liquids and complying with the requirements of Chapters 4, 5, 6, and 8 (e.g., specially compounded oils).

3.3.19.5 ***Type IV.*** Systems employing Class IV solvents and complying with the requirements of Chapters 4, 5, 6, and 9.

3.3.20 Tank.

3.3.20.1 ***Double-Walled Tank.*** A tank that has an inner and outer wall with an interstitial space (annulus) between the walls and that has a means for monitoring the interstitial space for a leak.

3.3.20.2 ***Process Tank.*** A tank containing solvent that is an integral part of the drycleaning machine or an integral part of the drycleaning process.

3.3.20.3 ***Storage Tank.*** A tank used for the storage of new or distilled solvent which is not an integral part of the drycleaning machine.

3.3.21 Trunnion Shaft (Spider and Trunnion). A shaft that supports the rotating cylinder.

3.3.22 Tumbler.

3.3.22.1 ***Drying Tumbler.*** Any equipment in which solvent-cleaned textiles are tumbled, agitated, and dried or deodorized while heated air circulates through the load to remove the solvent.

3.3.22.2 ***Reclaiming Tumbler.*** A drying tumbler that reclaims the solvent from vapors.

3.3.23 Working Pressure. The maximum filter pump discharge pressure.

Chapter 4 General Plant Requirements

4.1 General. Drycleaning operations, including the design, operation, and maintenance of buildings and premises, shall conform with the provisions of Chapter 4.

4.1.1 Classification. The provisions of this chapter shall apply to drycleaning operations using all classes of solvents.

4.1.1.1 Plants employing more than one class of solvent for drycleaning shall comply with the requirements for the numerically lowest class of solvent employed as defined in 3.3.16.

4.1.1.2 In addition to the provisions of this chapter, drycleaning operations shall conform with the specific requirements of Chapters 7 through 9 applicable to the class of solvent used.

4.1.2 Change of Solvent Class.

4.1.2.1 When a change in solvent classification is proposed for use with existing equipment, the provisions of Chapters 7 through 9 applicable to the new solvent class shall be met.

4.1.2.2 The AHJ shall be notified when a change in solvent classification is proposed, in accordance with 1.5.1.

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4.1.2.3 Equipment requirements shall be in accordance with Section 6.1.

4.2 Operating Requirements.

4.2.1 Prohibited Activities.

4.2.1.1 Type I Systems Prohibited. Type I drycleaning plants or systems shall be prohibited.

4.2.1.2 Open Systems Prohibited. Drycleaning by immersion and agitation in open vessels shall be prohibited.

4.2.1.3 Smoking Prohibited. Smoking in a drycleaning room shall be strictly prohibited.

4.2.1.4 General Public Operation Prohibited.

4.2.1.4.1 Drycleaning conducted by the general public shall be prohibited unless permitted by 4.2.1.4.2.

4.2.1.4.2 The prohibition in 4.2.1.4.1 shall not apply to Type IV drycleaning operations.

4.2.2 Preparation. All materials to be drycleaned shall be searched thoroughly in the receiving room, and all foreign materials, especially matches and metallic substances, shall be removed.

4.2.3* Employee Training. All employees shall be informed of the hazards of the solvents and processes employed in the plant and shall be trained in the proper storage, handling, use, and disposal of materials and wastes.

4.3 Maintenance and Housekeeping.

4.3.1 Extinguishing System Inspection. To ensure the reliable operation of steam or other extinguishing systems, periodic inspection of all valves and piping shall be made.

4.3.2 Lint and Refuse Removal.

4.3.2.1 After the close of the day's work, lint and refuse shall be removed from all traps, deposited in approved waste cans, removed from the premises, and disposed of safely.

4.3.2.2 At all other times, the trap covers shall remain securely in place.

4.3.3 Spill and Leak Prevention.

4.3.3.1 Proper maintenance and operating practices that help prevent leakage or unintentional escape of solvent or solvent vapors shall be followed.

4.3.3.2 Where solvent-saturated materials must be manually transferred from one piece of equipment to another, operating practices shall be designed to minimize both the solvent dripping on the floor and the vapor released.

4.3.4 Floor Cleaning.

4.3.4.1 Flammable and combustible liquids shall not be used for cleaning floors.

4.3.4.2 Spilled solvent or solvent drippings from transferred garments shall be cleaned up immediately.

4.3.4.3 Cleanup materials shall be stored or disposed of in an approved manner.

4.3.5 Tank Repair and Cleaning. The repairing and cleaning of tanks shall be performed in accordance with NFPA 326, *Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair*.

4.4 Construction.

4.4.1 General.

4.4.1.1 General building and structure design and construction shall be in accordance with *NFPA 5000, Building Construction and Safety Code*, except as modified herein.

4.4.1.2 Walls shall be of masonry or noncombustible construction, and wall finish shall be plain or plastered without furring or concealed spaces.

4.4.1.3 The floor or roof and ceiling construction above a drycleaning room shall have a fire resistance rating of not less than 1 hour.

4.4.2 Location.

4.4.2.1 Fire Department Vehicle Access.

4.4.2.1.1 The drycleaning building shall be located so that it is accessible from at least one side for fire-fighting and fire-control purposes.

4.4.2.1.2 The drycleaning building shall be located not less than 3 m (10 ft) from the line of adjoining property unless the wall facing the line of adjoining property has a fire resistance rating of not less than 2 hours without openings.

4.4.2.2 Drycleaning and Tank Storage.

4.4.2.2.1 Drycleaning and tank storage rooms shall be restricted to the lowest floor level of a building.

4.4.2.2.2 Drycleaning and tank storage rooms shall not be located below grade or above any other story.

4.4.3 Boilers.

4.4.3.1 Boilers shall be located, where possible, in a detached building.

4.4.3.2 Where located in the same building and in a room adjoining the drycleaning room, the boiler room shall be separated by fire partitions, without openings, having a fire resistance rating of not less than 2 hours.

4.4.3.3 Openings into the boiler room shall be at least 3 m (10 ft) from any openings into the drycleaning room.

4.4.4 Means of Egress. Means of egress shall conform with the provisions of NFPA *101, Life Safety Code*.

4.5 Building Services.

4.5.1 Electrical Wiring and Equipment. The electrical wiring and equipment of drycleaning plants shall conform with the requirements of NFPA 70, *National Electrical Code*.

4.5.2 Ventilation. Ventilation of all types of drycleaning plants shall be adequate to protect employees and the public in accordance with applicable government regulations.

4.5.3 Floors. The floors of a drycleaning room shall be of fire-resistive construction with a wearing surface of noncombustible and solvent-resistant material.

4.5.4* Drainage.

4.5.4.1 A drycleaning room shall be designed with an emergency drainage system to direct solvent leakage and fire protection water to a safe location.

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4.5.4.2 Where necessary to control the migration of the solvent, curbs, scuppers, or a special drainage system to control the spread of fire shall be provided, except in Type III and Type IV plants that have containment pans under the machine.

4.5.5 Sewer Connections. Drycleaning rooms shall be designed to prevent the discharge of solvents to public waterways, public sewers, or adjoining property.

4.6 Fire Protection.

4.6.1 General. To ensure the reliable operation of fire-extinguishing systems and equipment required by this standard, such systems and equipment shall be installed, inspected, tested, and maintained in accordance with Section 4.6.

4.6.2 Automatic Sprinkler Systems. Where required by this standard, automatic sprinkler systems shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and periodically inspected, tested, and maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.

4.6.3 Automatic Fire-Extinguishing Systems.

4.6.3.1 General.

4.6.3.1.1 Where required by this standard, automatic fire-extinguishing systems, including, but not limited to, water mist, clean agent, and carbon dioxide systems, shall be installed in accordance with the applicable reference standard.

4.6.3.1.2 Except for approved steam injection extinguishing systems, automatic fire-extinguishing systems shall be periodically inspected, tested, and maintained in accordance with the applicable reference standard and the manufacturers' operation and maintenance procedures.

4.6.3.2 Carbon Dioxide Fire-Extinguishing Systems. Carbon dioxide fire-extinguishing systems shall conform with NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*.

4.6.3.3 Clean Agent Fire-Extinguishing Systems. Clean agent fire-extinguishing systems shall conform with NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*.

4.6.3.4 Water Mist Fire-Extinguishing Systems. Water mist fire-extinguishing systems shall conform with NFPA 750, *Standard on Water Mist Fire Protection Systems*.

4.6.4 Portable Fire Extinguishers. Suitable numbers and types of portable fire extinguishers shall be installed and maintained throughout the drycleaning plant in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.

Chapter 5 Spotting

5.1 Solvents.

5.1.1 Spotting or prespotting shall be conducted only with Class II, Class III, or Class IV liquids or solvents stored in and dispensed from sealed DOT-approved containers or safety cans as defined in NFPA 30, *Flammable and Combustible Liquids Code*.

5.1.2 Spotting or prespotting shall be permitted to be conducted with Class I solvents if they are stored in and applied from sealed DOT-approved metal shipping containers of not more than 3.8 L (1 gal) capacity or approved safety cans.

5.1.3 Spotting shall be permitted to be conducted with Class I liquids or solvents if applied from plastic containers of not more than 0.5 L (1 pint) capacity.

5.2 Spotting Table Surface. The spotting table shall have a nonabsorbent surface.

5.3 Waste Streams. Waste streams from spotting operations shall be disposed of in a manner consistent with all applicable regulations.

5.4 Spotting Table Grounding. Spotting tables shall be permanently and effectively grounded.

Chapter 6 General Equipment Requirements

6.1 General.

6.1.1 All drycleaning machines and converted drycleaning equipment shall comply with the provisions of and be listed to comply with this standard.

6.1.2 Solvent.

6.1.2.1 Equipment shall be designed for the intended class of solvent used.

6.1.2.2 When a change in solvent classification is proposed for use with existing equipment, the specific requirements of Chapters 7 through 9 applicable to the new solvent class shall be met.

6.1.3 All drycleaning machines and conversions shall be furnished with one or more suitably placed nameplates indicating the following, as applicable:

(1) Minimum allowable solvent flash point classification
(2) Maximum rated cylinder speed
(3) Warnings that the machine is not to be operated with a solvent having a flash point less than that stated
(4) Warnings that the machine is not to be operated in excess of its rated cylinder speed
(5) Date of manufacture or conversion and, in the case of conversion, the original date of equipment manufacture
(6) Date of manufacture, conversion, or retrofit and, in the case of conversion or retrofit, the original date of equipment manufacture

6.1.4 Manufacturers shall provide the buyer with written instructions covering the proper installation and the safe operation and use of equipment and solvent.

6.1.5 Drycleaning machine wiring shall conform with the requirements of NFPA 79, *Electrical Standard for Industrial Machinery*.

6.1.6 All solvent-handling equipment shall be constructed and maintained so as to prevent leakage.

6.2 Pumps and Piping.

6.2.1 The transfer of solvent shall be through closed-circuit pipes.

6.2.2 Pipes, tubing, valves, and sight glasses shall be constructed of materials suitable for use with the solvent and shall be tested for a minimum pressure of 50 percent in excess of the maximum operating pressure.

6.2.3 Flow and level sight glasses shall be protected reliably against physical damage.

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6.2.4 All pumps shall be designed for the solvent being used and shall be provided with replaceable mechanical seals proven to be leakproof in solvent operation.

6.2.5 Positive displacement pumps for solvent service shall be fitted with relief valves or bypasses to prevent pressure in excess of the working pressure of the system.

6.2.6 Pump motors shall be designed or selected for compatibility with the solvent being used and the pump specifications.

6.3 Filters.

6.3.1 Filters operating above atmospheric pressure shall be constructed to withstand, without bursting, a pressure of five times the maximum allowable working pressure or to withstand, without yielding, a pressure of two and one-half times the maximum allowable working pressure.

6.3.2 Pressure-type filters shall be equipped with a reliable pressure gauge that shall be checked regularly for accuracy.

6.3.3 Filters shall not be operated at pressures exceeding those recommended by their manufacturers.

6.3.4 Air-Bleeding Lines.

6.3.4.1 Pressure vessels shall be provided with an air-bleeding valve and line connected to discharge into the washer or into the storage tank vent line.

6.3.4.2 Such air-bleeding lines shall not discharge into the room.

6.3.5 Pressure Relief Devices.

6.3.5.1 Filters shall be equipped with a pressure relief device that prevents the pressure within the filter from rising more than 10 percent above the working pressure of the filter.

6.3.5.2 The relief device shall not be smaller than 20 mm (¾ in.) pipe size and shall discharge into an underground tank or aboveground base tank of a drycleaning unit without a shutoff valve in the line.

6.4 Drycleaning Machines.

6.4.1 Drycleaning machines shall be of substantial construction to prevent distortion of their components and to minimize vibration that can cause damage to equipment or harm to personnel while the machines are in normal operation.

6.4.2 The units shall be securely attached to the floor or, if necessary, to special foundations to minimize transmission of vibration to surrounding areas.

6.4.3 Drycleaning machines shall be provided with doors or covers that prevent solvent from splashing onto the floor.

6.4.4 Cylinder access door(s) shall be interlocked as follows:

(1) Opening of the door(s) while there is solvent in the cylinder
(2) Opening of the door(s) while the cylinder is rotating
(3) Rotation of the cylinder or basket while the door(s) are open

Exception: Machines that require inching of the cylinder with the door open shall be permitted, provided that the solvent has been drained from the cylinder.

6.4.5 A manual push button to stop the machine shall be provided in front of the machine if the drycleaning machine is equipped with automatic controls.

6.4.6 Drycleaning machines shall be equipped with brakes or other means to stop the machine and avoid generation of sparks or excessive heat.

6.4.7 Drycleaning machines shall be provided with a device that shuts off all inlet supply valves to the machine in the event the solvent level in the machine reaches the bottom of the trunnion shaft, unless an overflow means has been provided that is below the bottom of the trunnion and connected to a storage or process tank by a pipe at least one size larger than the solvent inlet pipe to the machine and without a shutoff valve.

6.4.8 Individual button or lint traps shall be provided with drycleaning machines and shall be located between the machine drain and the storage and process tanks.

6.4.9 The solvent inlet pipe into a drycleaning machine shall be arranged to deflect the solvent stream away from the door opening.

6.4.10 Drycleaning machines shall be constructed with clearance between the cylinder or basket and the outer casing to prevent striking or rubbing of parts of the rotating cylinder against the outer casing.

6.5 Stills.

6.5.1 A check valve shall be installed in the steam line between the boiler and the still.

6.5.2 Water separators shall be provided on stills to reduce the amount of water entrapped with the distilled solvent.

6.6 Automatic Fire-Extinguishing Systems. The installation of automatic fire-extinguishing systems for the protection of drycleaning equipment shall conform with Section 4.6.

Chapter 7 Type II Drycleaning Plants

7.1 Application. This chapter shall apply to drycleaning plants or systems utilizing Class II solvents.

7.2 Location and Construction.

7.2.1 Separation. Type II drycleaning plants located in buildings with other occupancies shall be separated vertically and horizontally from other occupancies in accordance with Section 7.2.

7.2.1.1 Type II drycleaning plants shall be separated from assembly, educational, health care, detention and correctional, and residential occupancies by a fire barrier having a minimum fire resistance rating of 4 hours.

7.2.1.2 Openings in the required fire barriers shall be equipped with self-closing or automatic-closing opening protection having a minimum 3-hour fire protection rating except as permitted in 7.2.1.3.

7.2.1.3 The required fire barrier shall be permitted to be a 2-hour resistance rating with self-closing or automatic-closing opening protection having a 1½-hour fire protection rating in drycleaning plants where the quantity of Class II solvent in drycleaning machines and storage does not exceed 568 L (150 gal) and drycleaning machines are equipped with instrumentation, equipment, or controls that provide any one of the following:

(1) Features that limit oxygen concentrations to less than 8 percent by volume
(2) Features that limit solvent vapor concentration to less than 25 percent of the lower explosive limit (LEL)

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(3)*Features that limit solvent vapor concentration at or below 60 percent of the LEL where automatic instrumentation with safety interlocks is provided in accordance with NFPA 69, *Standard on Explosion Prevention Systems*
(4) Features that incorporate an integral automatic fire-extinguishing system in accordance with Section 6.6

7.2.1.4 Type II drycleaning plants shall be separated from business, factory/industrial, mercantile, storage, and other similar occupancies by a fire barrier having a minimum fire resistance rating of 2 hours.

7.2.1.5 Openings in the required fire barriers shall be equipped with self-closing or automatic-closing opening protection having a minimum 1½-hour fire protection rating.

7.2.1.6 The required fire barrier shall be permitted to be a 1-hour resistance rating with self-closing or automatic-closing opening protection having a ¾-hour fire protection rating in drycleaning plants where the quantity of Class II solvent in drycleaning machines and storage does not exceed 568 L (150 gal) and drycleaning machines are equipped with instrumentation, equipment, or controls that provide any one of the following:

(1) Features that limit oxygen concentrations to less than 8 percent by volume
(2) Features that limit solvent vapor concentration to less than 25 percent of the LEL
(3)*Features that limit solvent vapor concentration at or below 60 percent of the LEL where automatic instrumentation with safety interlocks is provided in accordance with NFPA 69, *Standard on Explosion Prevention Systems*
(4) Features that incorporate an integral automatic fire-extinguishing system in accordance with Section 6.6

7.2.2 Automatic Sprinklers.

7.2.2.1 A building housing a drycleaning plant shall be protected throughout by an approved automatic sprinkler system in accordance with 4.6.2 except as permitted in 7.2.2.2.

7.2.2.2 Automatic sprinklers shall not be required in drycleaning plants where the quantity of Class II solvent in drycleaning machines and storage does not exceed 568 L (150 gal) and drycleaning machines are equipped with instrumentation, equipment, or controls that provide any one of the following:

(1) Features that limit oxygen concentrations to less than 8 percent by volume
(2) Features that limit solvent vapor concentration to less than 25 percent of the LEL
(3)*Features that limit solvent vapor concentration at or below 60 percent of the LEL where automatic instrumentation with safety interlocks is provided in accordance with NFPA 69, *Standard on Explosion Prevention Systems*
(4) Features that incorporate an integral automatic fire-extinguishing system conforming with Section 6.6

7.2.3 Separation. Where the quantity of solvent in drycleaning machines and storage exceeds 568 L (150 gal), the drycleaning room shall be separated from the rest of the drycleaning plant by a fire barrier having a fire resistance rating of not less than 2 hours.

7.2.4 Openings in Fire Barriers. Openings in such fire barriers shall be equipped with self-closing or automatic-closing opening protection having a minimum of 1½-hour fire protection rating.

7.3 Building Services.

7.3.1 Heating, Ventilation, and Air-Conditioning.

7.3.1.1 Heating shall be by steam, hot water, or hot oil only.

7.3.1.2 A mechanical system of ventilation with means for remote control shall be installed in drycleaning rooms in accordance with NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, and NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids*.

7.3.1.3 A mechanical system of ventilation serving a drycleaning room shall serve no other room.

7.3.1.4 The ventilation system shall have sufficient capacity to exhaust 0.3 $m^3/min/m^2$ (1 $ft^3/min/ft^2$) of floor area from the drycleaning room to a safe outdoor location.

7.3.1.5 The blades or running rings of exhaust fans shall be of nonferrous metal, and motors for fans shall not be installed in ducts.

7.3.2 Electrical Installations. Electrical equipment and wiring in a Type II drycleaning room shall comply with the provisions of NFPA 70, *National Electrical Code*, for use in Class I, Division 2 hazardous locations.

7.4 Processes and Equipment.

7.4.1 Storage and Treatment Tanks.

7.4.1.1 Tanks shall be constructed in accordance with 4.2.3, Design Standards, of NFPA 30, *Flammable and Combustible Liquids Code*.

7.4.1.2 Tanks shall be installed in accordance with 4.2.4, Design of Tank Supports, and 4.3.1, Foundation for and Anchoring of Tanks, of NFPA 30, *Flammable and Combustible Liquids Code*.

7.4.1.3 Tank Vents.

7.4.1.3.1 Storage tanks and atmospheric treatment tanks installed aboveground shall be provided with emergency relief venting to relieve excessive internal pressure caused by exposure fire.

7.4.1.3.2 The total capacity of an emergency venting device, including the capacity of any normal vent, shall not be less than that derived from Table 7.4.1.3.2 and shall be permitted to be multiplied by 0.3 for tanks installed in sprinklered drycleaning rooms.

Table 7.4.1.3.2 Wetted Area Versus m^3/hr (ft^3/hr) Free Air

m^2	ft^2	m^3/hr	ft^3/hr
1.9	20	598	21,100
2.8	30	895	31,600
3.7	40	1192	42,100
4.6	50	1492	52,700
5.6	60	1790	63,200
6.5	70	2087	73,700
7.4	80	2385	84,200
8.4	90	2685	94,800
9.3	100	2974	105,000
11.1	120	3568	126,000
13.0	140	4163	147,000
14.9	160	4758	168,000
16.7	180	5380	190,000
18.6	200	5976	211,000

Notes:
(1) At absolute pressure of 101.3 kPa (14.7 psi) and 15.6°C (60°F).
(2) Interpolate for intermediate values.

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7.4.1.3.3 The wetted area of a tank or container shall be calculated on the basis of 100 percent of the surface area of the tank.

7.4.1.3.4 Atmospheric tanks shall be limited to pressures not exceeding 17.2 kPa (2.5 psi) under emergency venting conditions.

7.4.1.3.5 In no case shall a vent be less than 30 mm (1¼ in.) pipe size.

7.4.1.3.6 The vent of a tank installed inside a building shall terminate outside the building.

7.4.1.4 An inside storage or treatment tank shall be equipped with a gauging device designed and installed so that solvent or vapors cannot be discharged into the building during normal service.

7.4.1.5 A gauge glass or sight glass that allows the escape of solvent from the tank when broken shall not be used.

7.4.1.6 Storage tanks installed underground, outside aboveground, or inside detached storage buildings shall be constructed and installed in accordance with NFPA 30, *Flammable and Combustible Liquids Code*.

7.4.1.7 Tank Capacity.

7.4.1.7.1 Storage and treatment tanks installed inside aboveground shall not exceed an individual capacity of 5678 L (1500 gal).

7.4.1.7.2 Total tank capacity inside shall not exceed 11,355 L (3000 gal).

7.4.1.8 Tanks shall be permitted to be located aboveground inside a drycleaning room that conforms with the requirements of Section 7.2, and shall be provided with secondary containment.

7.4.1.9 An inside storage tank shall be provided with a fill pipe originating outside the building.

7.4.1.10 Fill pipes shall have approved connections and permanent identification of applicable solvent.

7.4.1.11 Inside aboveground storage tanks shall be located as close as practicable to the drycleaning unit(s) to which they are connected.

7.4.1.12 Treatment tanks shall not be used for the storage of new or distilled solvents.

7.4.1.13 Treatment tanks subject to greater than atmospheric pressure shall be designed for a working pressure not less than 103 kPa (15 psi) and shall be built in accordance with the principles of the ASME *Boiler and Pressure Vessel Code*, Section VIII, "Rules for the Construction of Pressure Vessels, Division 1."

7.4.1.14 The treatment tanks specified in 7.4.1.13 shall be equipped with a pressure relief device that prevents the pressure in the tank from rising more than 10 percent above the working pressure of the tank.

7.4.1.15 The relief device specified in 7.4.1.14 shall not be smaller than 20 mm (¾ in.) pipe size and shall discharge into an underground tank or aboveground base tank of a drycleaning unit without a shutoff valve in the line.

7.4.2 Pumps, Piping, and Solvent Coolers.

7.4.2.1 Aboveground Piping, Valves, and Fittings.

7.4.2.1.1 The aboveground transfer of solvent between any tank or equipment shall flow through closed circuits of iron or steel piping or through valves or fittings composed of brass or bronze.

7.4.2.1.2 Flexible Hose.

7.4.2.1.2.1 Flexible hose suitable for the solvent shall be permitted as necessary for connections between vibrating and stationary equipment.

7.4.2.1.2.2 Such flexible hose shall have a rating of 50 percent above the maximum operating pressure but not less than 34 kPa [(0.3 atm) (gauge pressure of 5 psi)].

7.4.2.1.3 If a flow sight glass could, if damaged, allow the escape of flammable liquids, then it shall be of a type not damaged by heat and shall be protected against physical damage.

7.4.2.2 Underground Piping, Valves, and Fittings. Underground piping, valves, and fittings shall be installed and tested in accordance with NFPA 30, *Flammable and Combustible Liquids Code*.

7.4.2.3 Pumps.

7.4.2.3.1 Service pumps shall be provided to remove sludge from underground tanks.

7.4.2.3.2 Discharge.

7.4.2.3.2.1 The suction pipe shall be carried to the tank bottom, and the pump shall discharge to a suitable container.

7.4.2.3.2.2 In no case shall the discharge be into a sewer.

7.4.2.3.3 All pumps that handle solvent shall be designed for use with flammable liquids.

7.4.2.3.4 Pumps of the positive displacement type shall be fitted with a relief valve or bypass set to prevent pressures in excess of the working pressure of the system.

7.4.2.3.5 Solvent Coolers.

7.4.2.3.5.1 Where a continuous solvent flow circulation is maintained by means of a circulating pump, solvent coolers shall be provided to maintain a solvent temperature not exceeding 32.2°C (90°F).

7.4.2.3.5.2 Visual and audible alarm devices shall be provided to warn the operator when the solvent temperature exceeds 32.2°C (90°F).

7.4.3 Drycleaning Machines, Stills, Drying Cabinets, and Tumblers.

7.4.3.1 General. Only steam, hot water, or hot oil shall be used as a source of heat for equipment.

7.4.3.2 Equipment Requirements.

7.4.3.2.1 Drycleaning machines with drying capabilities and reclaiming tumblers shall be equipped with automatic extinguishing systems installed and maintained in accordance with Section 4.6 and shall be provided with self-closing explosion hatches arranged to open away from the operator and having an area equal to at least 0.22 m^2/m^3 (1 $ft^2/15$ ft^3) of cylinder volume.

7.4.3.2.2 Automatic extinguishing systems shall not be required if the equipment contains instrumentation, equipment, or controls that provide any one of the following:

(1) Features that limit oxygen concentration to less than 8 percent by volume
(2) Features that limit solvent vapors to less than 25 percent of the LEL
(3)*Features that limit solvent vapor concentration at or below 60 percent of the LEL where automatic instrumentation with safety interlocks is provided in accordance with NFPA 69, *Standard on Explosion Prevention Systems*

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7.4.3.2.3 The fan shall be properly housed and interlocked to ensure operation while the equipment is in use.

7.4.3.2.4 The fan, blades, and running rings shall be constructed of nonferrous metal.

7.4.3.3 Stills.

7.4.3.3.1 If steam is used as the source for heat, a pressure-regulating valve shall be installed in the steam supply line to the still.

7.4.3.3.2 Stills shall be liquidtight and gastight.

7.4.3.3.3 Stills shall be designed for operation based on the vacuum principle.

7.4.3.3.4 If a relief valve is provided, it shall be equipped with a vent line extending to the outside.

7.4.3.3.5 Each still shall be provided with a combination vacuum and pressure gauge.

7.4.3.3.6 Each still shall be equipped with an automatic valve to maintain the solvent level in the still at the proper height.

7.4.4* Static Electricity.

7.4.4.1 Storage tanks, treatment tanks, filters, pumps, piping, ductwork, drycleaning units, stills, drying cabinets, tumblers, and other equipment in the drycleaning room shall be bonded together and grounded.

7.4.4.2 Isolated units of equipment shall be grounded.

7.4.4.3 Special consideration shall be given to the generation and accumulation of static electricity where fabrics are loaded into or removed from drycleaning units.

7.4.4.4 Where fabrics are transferred from one piece of equipment to another, the two pieces of equipment shall be electrically bonded together.

Chapter 8 Type III Drycleaning Plants

8.1 Type IIIA Drycleaning Plants.

8.1.1 Application. The provisions of this section shall apply to Type IIIA drycleaning plants and systems located in buildings with or without other occupancies.

8.1.2 Special Provisions.

8.1.2.1 Separation. Type IIIA drycleaning plants located in buildings with other occupancies shall be separated from other occupancies by a fire barrier having a minimum 2-hour fire resistance rating.

8.1.2.2 Openings in the required fire barriers shall be equipped with self-closing or automatic-closing opening protection having a minimum 1½-hour fire protection rating except as permitted in 8.1.2.3 and 8.1.2.4.

8.1.2.3 The required fire barrier shall be permitted to be a 1-hour resistance rating with self-closing or automatic-closing opening protection having a ¾-hour fire protection rating in drycleaning plants located in buildings protected throughout by an automatic sprinkler system installed in accordance with 4.6.2.

8.1.2.4 The required fire barrier shall be permitted to be a 1-hour resistance rating with self-closing or automatic-closing opening protection having a ¾-hour fire protection rating in drycleaning plants where the quantity of Class IIIA solvent in drycleaning machines and storage does not exceed 1250 L (330 gal) and drycleaning machines are equipped with instrumentation, equipment, or controls that provide any one of the following:

(1) Features that limit oxygen concentrations to less than 8 percent by volume
(2) Features that limit solvent vapor concentration to less than 25 percent of the LEL
(3)*Features that limit solvent vapor concentration at or below 60 percent of the LEL where automatic instrumentation with safety interlocks is provided in accordance with NFPA 69, *Standard on Explosion Prevention Systems*
(4) Features that limit solvent temperatures to less than 16.7°C (30°F) below their flash points
(5) Features that incorporate equipment approved for use in Class I, Division 2 hazardous locations
(6) Features that incorporate an integral automatic fire-extinguishing system conforming with Section 4.6

8.1.2.5 Automatic Sprinklers. Type IIIA drycleaning plants shall be protected throughout by approved automatic sprinkler systems installed in accordance with 4.6.2 except as permitted in 8.1.2.6.

8.1.2.6 Automatic sprinkler systems shall not be required in drycleaning plants where the quantity of Class IIIA solvent in drycleaning machines and storage does not exceed 1250 L (330 gal) and drycleaning machines are equipped with instrumentation, equipment, or controls that provide any one of the following:

(1) Features that limit oxygen concentrations to less than 8 percent by volume
(2) Features that limit solvent vapor concentration to less than 25 percent of the LEL
(3)*Features that limit solvent vapor concentration at or below 60 percent of the LEL where automatic instrumentation with safety interlocks is provided in accordance with NFPA 69, *Standard on Explosion Prevention Systems*
(4) Features that limit solvent temperatures to less than 16.7°C (30°F) below their flash points
(5) Features that incorporate equipment approved for use in Class I, Division 2 hazardous locations
(6) Features that incorporate an integral automatic fire-extinguishing system conforming with Section 4.6

8.1.3 Equipment Requirements.

8.1.3.1 The electrical equipment and wiring of a Type IIIA drycleaning system shall be in accordance with NFPA 70, *National Electrical Code*, for ordinary locations.

8.1.3.2 For stills, drycleaning machines, or reclaiming tumblers in which solvent is ordinarily heated to greater than 16.7°C (30°F) below the flash point, the electrical components and wiring on such equipment shall be in accordance with NFPA 70, *National Electrical Code*, Class I, Division 2 except as permitted in 8.1.3.3 or 8.1.3.4.

8.1.3.3 The electrical equipment and wiring on reclaiming tumblers or drycleaning machines without stills shall be in accordance with NFPA 70, *National Electrical Code*, for ordinary locations where they contain instrumentation, equipment, or controls that provide any one of the following:

(1) Features that limit oxygen concentrations to less than 8 percent by volume
(2) Features that limit solvent vapor concentration to less than 25 percent of the LEL

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(3)*Features that limit solvent vapor concentration at or below 60 percent of the LEL where automatic instrumentation with safety interlocks is provided in accordance with NFPA 69, *Standard on Explosion Prevention Systems*
(4) Features that limit solvent temperatures to less than 16.7°C (30°F) below their flash points

8.1.3.4 The electrical equipment and wiring on stills or drycleaning machines with stills shall be in accordance with NFPA 70, *National Electrical Code*, for ordinary locations provided that they are equipped with instrumentation, equipment, or controls that provide for automatic de-energization of equipment and wiring when both the following apply:

(1) Integrity of the still has been compromised.
(2) Solvent or vapor at temperatures greater than 16.7°C (30°F) below the flash point is released.

8.1.3.5 Drycleaning machines with drying capabilities and reclaiming tumblers shall be equipped with automatic extinguishing systems installed and maintained in accordance with Section 4.6 and shall be provided with self-closing explosion hatches arranged to open away from the operator and having an area equal to at least 0.22 m^2/m^3 (1 $ft^2/15$ ft^3) of cylinder volume except as permitted in 8.1.3.6.

8.1.3.6 Automatic extinguishing systems and self-closing hatches shall not be required if the equipment contains instrumentation, equipment, or controls that independently provide any one of the following:

(1) Features that limit oxygen concentrations to less than 8 percent by volume
(2) Features that limit solvent vapor concentrations to less than 25 percent of the LEL
(3)*Features that limit solvent vapor concentration at or below 60 percent of the LEL where automatic instrumentation with safety interlocks is provided in accordance with NFPA 69, *Standard on Explosion Prevention Systems*
(4) Features that limit solvent temperatures to less than 16.7°C (30°F) below their flash points

8.1.4 Storage Tanks, Treatment Tanks, and Filters.

8.1.4.1 Storage tanks, treatment tanks, and filters shall comply with the requirements of Section 7.4 except as permitted in 8.1.4.2.

8.1.4.2 In drycleaning plants located in buildings with other occupancies or without sprinklers, each aboveground tank shall have a capacity of not more than 1250 L (330 gal), and the total solvent capacity of such plant, including inside aboveground and underground storage tanks, shall not exceed 4996 L (1320 gal).

8.1.5 Electrical Installations. Electrical equipment and wiring in a Type IIIA drycleaning room shall be in accordance with NFPA 70, *National Electrical Code*, for ordinary locations.

8.2 Type IIIB Drycleaning Plants.

8.2.1 Application. Section 8.2 shall apply to drycleaning plants or systems utilizing Class IIIB solvents.

8.2.2 General Restriction. When Class IIIB solvents are heated in excess of 16.7°C (30°F) below their flash points, the provisions of 8.1.2 and 8.1.3 shall apply.

8.2.3 Requirements.

8.2.3.1 Separation. Type IIIB drycleaning plants located in buildings with other occupancies shall be separated from other occupancies by a fire barrier having a minimum 1-hour fire resistance rating.

8.2.3.2 Openings in required fire barriers shall be equipped with self-closing or automatic-closing opening protection having a minimum ¾-hour fire protection rating except as permitted in 8.2.3.3.

8.2.3.3 Openings in fire barriers separating drycleaning plants from exit access corridors shall be equipped with opening protection having a minimum 20-minute fire protection rating.

8.2.3.4 Automatic Sprinklers. Type IIIB drycleaning plants shall be protected throughout by approved automatic sprinkler systems installed in accordance with 4.6.2 unless the quantity of Class IIIB solvent in drycleaning machines and storage does not exceed 12,490 L (3300 gal).

8.2.4 Equipment Requirements.

8.2.4.1 Electrical equipment and wiring in a Type IIIB plant or system shall comply with the provisions of NFPA 70, *National Electrical Code*, for ordinary locations.

8.2.4.2 Storage tanks, treatment tanks, and filters shall comply with the requirements of Section 7.4 except as permitted in 8.2.4.3.

8.2.4.3 Tank Capacity.

8.2.4.3.1 The capacity of any inside aboveground tank shall not exceed 9463 L (2500 gal), and the aggregate capacity of all inside aboveground storage and treatment tanks in an unenclosed area shall not exceed 28,391 L (7500 gal).

8.2.4.3.2 Capacities in excess of 28,391 L (7500 gal) shall be located in a separate room as permitted by 7.4.1.8.

Chapter 9 Type IV Drycleaning Plants

9.1 Application.

9.1.1 This chapter shall apply to drycleaning plants or systems utilizing Class IV solvents.

9.1.2 The provisions of this chapter shall apply to Type IV drycleaning plants and systems that are located in buildings with or without other occupancies and in which the drycleaning is not conducted by the public.

9.2 Building Services.

9.2.1 Ventilation, Heating, and Air-Conditioning.

9.2.1.1 Manually operated emergency ventilation for spills or leaks shall be installed to provide an air change every 5 minutes within 4.57 m (15 ft) of equipment using Class IV solvents. The switch for this ventilation equipment shall be readily accessible and clearly identified.

9.2.1.2 Air for combustion for gas-fired and oil-fired devices, where such devices are located in the drycleaning rooms, shall come through ducts from a clean source of air outside the building.

9.2.1.3 Apparatus with open flames or with exposed electric heating elements shall be protected from any equipment using Class IV solvents by providing the following:

(1) Exterior intakes for combustion air
(2) If present, exhaust vents from the drycleaning equipment that are located remotely from the air intakes

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Exception: Apparatus located in a separate, enclosed room or cabinet that is independently ventilated to prevent the air from the drycleaning system from being drawn toward the apparatus.

9.2.1.4 The exhaust ventilation outlets shall be located no closer than 7.63 m (25 ft) from any openings in other occupancies.

9.2.2 Electrical Installations. All electrical equipment, devices, and wiring for light and power shall be installed in accordance with the requirements of NFPA 70, *National Electrical Code*, for general-purpose use.

9.3 Processes and Equipment.

9.3.1 General.

9.3.1.1 Solvent storage and treatment tanks and all interior steel surfaces that tend to corrode when exposed during ordinary operation to solvent and to air alternately shall be protected against corrosion.

9.3.1.2 Pumps, filters, or any closed containers that ordinarily are completely filled with solvent and steam coils or chests that are immersed in solvent or that ordinarily do not tend to corrode shall be permitted to be constructed of carbon steel without corrosion protection.

9.3.1.3 Exhaust ventilation ducts from equipment shall be sealed, taped, or soldered, and the discharge shall extend above the roofline unless it leads directly into a solvent recovery system.

9.3.2 Pumps and Piping. Pumps shall be permitted to be used for the transfer of solvent.

9.3.3 Drycleaning Units and Stills.

9.3.3.1 Drycleaning units shall comply with the requirements of Section 6.4.

9.3.3.2 Atmospheric solvent stills shall be constructed to prevent hot solvent vapor from escaping into the room where operated under normal conditions and at rated capacity.

9.3.4* Drycleaning Using Nonflammable Liquefied Gases in Pressure Vessels.

9.3.4.1 Pressure Vessel Requirements.

9.3.4.1.1* A pressure vessel shall be in accordance with this section if it serves as a drycleaning machine and operates at a pressure greater than 1034 kPa (150 psi).

9.3.4.1.2 Pressure vessels used for drycleaning shall be constructed in accordance with ASME *Boiler and Pressure Vessel Code*.

9.3.4.1.3 Pressure piping and associated components shall be in accordance with ANSI/ASME B31.1, *Power Piping*.

9.3.4.2 Liquefied Gas Requirements. Storage of nonflammable liquefied gases for use in pressure vessels shall be in accordance with NFPA 55, *Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks*.

9.3.4.2.1 Liquefied Carbon Dioxide Requirements.

9.3.4.2.1.1 A listed gas detection system shall be installed in the areas of indoor storage and used to notify the occupants if the carbon dioxide concentration reaches an unsafe level.

9.3.4.2.1.2 Instrumentation and controls shall be incorporated into the design of the drycleaning machine to sound an alarm and to shut down the machine when there is a system malfunction that could result in an unintentional release of carbon dioxide.

9.3.4.2.1.3 Consideration shall be given to the possibility of carbon dioxide drifting and settling into adjacent places outside where the carbon dioxide is used, and a detection system shall be installed in that location.

9.3.4.2.1.4 Intentional or unintentional venting from the drycleaning equipment shall be released outdoors in a location a safe distance away from any air intake resulting in entrainment.

9.3.4.2.1.5 Doors and hatches on the equipment shall be safety interlocked to prevent opening when pressurized above ambient pressure.

9.3.4.2.1.6 Maintenance on the machine shall be performed by qualified trained personnel.

9.3.4.2.1.7 Operators shall be fully trained and competent in the procedures and precautions for start-up, shut-down, normal operations, and emergency procedures.

9.3.4.2.1.8* Appropriate warning signs shall be affixed in the area where carbon dioxide is used or stored.

Chapter 10 Laundry Equipment in Drycleaning Plants

10.1 Dryers Temperature Control. Laundry dryers, as used in drycleaning plants, shall be equipped with safety controls to ensure proper temperature and cool-down of textiles prior to the equipment being unloaded.

10.2 Listing. Laundry-drying equipment with a load capacity greater than 0.2 m^3 (7 ft^3) must be listed by a national recognized testing lab and approved for use exclusively with water in a commercial or industrial setting.

10.3 Location. Equipment shall be located in rooms with an intake and outlet air exchange equal to or exceeding the air exchange required for the equipment.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.6 The "anticipated conditions" are the normal temperatures and pressures anticipated in the drycleaning process. It is not the committee's intent to require the solvent supplier to anticipate how all the possible additives that are added during the drycleaning process might change the solvent properties. Requirements for the safe storage and use of the great variety of flammable and combustible liquids commonly available depend primarily on their fire characteristics, particularly the flash point, which is the basis for the classification system. It should be noted that a liquid's classification can be changed by contamination. For example, placing a Class II liquid into a tank that last contained a Class I liquid can change the flash point of the Class II liquid so that it falls into the range of a Class I liquid. The same situation can exist where a Class II liquid is exposed to the vapors of a Class I liquid via an interconnecting vapor line. Care should be exercised in such cases to apply the requirements appropriate to the actual classification. Refer to the NFPA *Fire Protection Guide to Hazardous Materials* for flash point and other fire hazard data.

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The volatility of a liquid is increased by heating. Where Class II or Class III liquids are exposed to storage conditions, use conditions, or process operations in which they are naturally or artificially heated to or above their flash points, additional fire safety features, such as ventilation, separation from ignition sources, diking, or electrical area classification, might be necessary.

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.4 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.2 Combustible Liquid. The flash point results can vary based on the test method used. The flash point is to be determined by the test procedures and apparatus set forth in NFPA 30, *Flammable and Combustible Liquids Code*, 1.7.4.

A.3.3.4 Drycleaning. Methods of drycleaning include the following:

(1) Immersion and agitation with the solvent in closed machines
(2) Spotting with cleaning solvents
(3) Dual-phase processing

A.3.3.6 Drycleaning Plant. A facility that has only a solvent reclaiming apparatus used to reclaim solvent is not considered a drycleaning plant. This was the subject of a Formal Interpretation, FI 90-1, that has since been retired with the incorporation of this advisory material.

A.3.3.9 Flammable Liquid. The flash point results can vary based on the method used. The flash point is to be determined by the test procedures and apparatus set forth in NFPA 30, *Flammable and Combustible Liquids Code*, 1.7.4.

A.3.3.10 Flash Point. Certain mixtures of flammable or combustible liquids and other substances, such as halogenated hydrocarbons, either do not exhibit a flash point using the standard closed-cup test methods or will exhibit elevated flash points. However, if the other substance is the more volatile component, preferential evaporation of this component can result in a liquid that does have a flash point or has a flash point that is lower than the original mixture. To evaluate the fire hazard of such mixtures, flash point tests should be conducted after fractional evaporation of 10, 20, 40, 60, or even 90 percent of the original sample or other fractions representative of the conditions of use. In the event that the flammable or combustible liquid is a blend of substances having differing flash points, the flash point of each component of the blend needs to be reported if there is a potential for the components to separate during normal operation.

The appropriate test procedure and apparatus are as follows:

(1) The flash point of liquids having a viscosity less than 45 SUS at 37.8°C (100°F) and a flash point below 93.4°C (200°F) is determined in accordance with ASTM D 56, *Test Method for Flash Point by Tag Closed Tester*.
(2) The flash point of liquids having a viscosity of 45 SUS or more at 37.8°C (100°F) or a flash point of 93.4°C (200°F) or higher is determined in accordance with ASTM D 93, *Standard Test Methods for Flash Point by Pensky–Martens Closed Cup Tester*.

A.4.2.3 The content, frequency, and documentation of employee right-to-know training should conform with the applicable requirements of 29 CFR 1910.1200, "Hazard Communication." Fire prevention and fire safety training conforming with 29 CFR 1910.38, "Employee Emergency Plans and Fire Prevention Plans," and 29 CFR 1910.156, "Fire Brigades," can also be required. Where employees are required to wear personal protective equipment, they should be thoroughly trained in the use and maintenance of that equipment.

A.4.5.4 Annex A of NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, provides information on such protection.

A.7.2.1.3(3) The instrumentation required would monitor the control of the concentration of combustible components. Above 60 percent of the combustible mixture LEL, an interlock would automatically cause a reduction in combustible vapor concentration by stopping a liquid feed flow, turning off heat sources, and/or purging with additional air. Instrumentation is calibrated as recommended by the manufacturer. Consideration is given where the enclosure being protected presents a personnel hazard for an alarm to indicate abnormal operation of the system. Such alarms are set at a lower percentage of LEL, typically 50 percent.

A.7.2.1.6(3) See A.7.2.1.3(3).

A.7.2.2.2(3) See A.7.2.1.3(3).

A.7.4.3.2.2(3) See A.7.2.1.3(3)

A.7.4.4 For further information, see NFPA 77, *Recommended Practice on Static Electricity*.

A.8.1.2.4(3) See A.7.2.1.3(3).

A.8.1.2.6(3) See A.7.2.1.3(3).

A.8.1.3.3(3) See A.7.2.1.3(3).

A.8.1.3.6(3) See A.7.2.1.3(3).

A.9.3.4 Consideration shall be given if a flammable or combustible solvent is blended with a nonflammable liquefied gas.

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A.9.3.4.1.1 Typical pressures in operation for carbon dioxide drycleaning machines can be greater than 4826 kPa (700 psi).

A.9.3.4.2.1.8 See NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, for additional information on signage for carbon dioxide systems. Some examples of signage follow.

(1) Typical sign where carbon dioxide is stored or used:

WARNING
CARBON DIOXIDE GAS
WHEN ALARM OPERATES, VACATE IMMEDIATELY

(2) Typical sign in nearby space where carbon dioxide can accumulate to hazardous levels:

CAUTION
CARBON DIOXIDE IN A NEARBY SPACE
CAN COLLECT HERE.
WHEN ALARM OPERATES, VACATE IMMEDIATELY

(3) Typical sign outside each entrance to carbon dioxide storage rooms:

CAUTION
CARBON DIOXIDE GAS
VENTILATE THE AREA BEFORE ENTERING.
A HIGH CARBON DIOXIDE GAS CONCENTRATION
CAN OCCUR IN THIS AREA
AND CAN CAUSE SUFFOCATION

Annex B Guidance on Conversions

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 Modification of new or existing drycleaning machines, drying tumblers, or reclaiming tumblers to permit the use of a different class of solvent than that specified by the original equipment manufacturer is technically feasible and is being conducted. The authority having jurisdiction should be notified prior to installation of the converted equipment, and documentation should be presented to the AHJ showing that the conversion was done correctly in accordance with this standard. It is strongly recommended that the AHJ contact the original equipment manufacturer or listing agency to verify compatibility with the change in the class of solvent.

Changing the class of solvent used in a drycleaning machine, drying tumbler, or reclaiming tumbler requires that the equipment and the plant comply with the chapter specific to the solvent in use, in addition to Chapter 4, General Plant Requirements. Additionally, the entire piece of equipment that has been modified is required to be listed per 6.1.1 for the new class of solvent being put into use. At the present time, the Committee is unaware of any acceptable conversions in which a machine using a higher-class solvent is being converted to use a lower-class solvent.

Annex C Informational References

C.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

C.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 2000 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, 2007 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 2003 edition.

NFPA 77, *Recommended Practice on Static Electricity*, 2007 edition.

Fire Protection Guide to Hazardous Materials, 2001 edition.

C.1.2 Other Publications.

C.1.2.1 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM D 56, *Test Method for Flash Point by Tag Closed Tester,* 1997.

ASTM D 93, *Standard Test Methods for Flash Point by Pensky–Martens Closed Cup Tester,* 1997.

C.1.2.2 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Title 29, Code of Federal Regulations, Part 1910.38, "Employee Emergency Plans and Fire Prevention Plans," 1998.

Title 29, Code of Federal Regulations, Part 1910.156, "Fire Brigades," 1998.

Title 29, Code of Federal Regulations, Part 1910.1200, "Hazard Communication," 1998.

C.2 Informational References. (Reserved)

C.3 References for Extracts in Informational Sections. (Reserved)

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3.3.78 Effective Ground-Fault Current Path. An intentionally constructed, permanent, low impedance electrically conductive path designed and intended to carry ~~underground~~ electric fault current ~~conditions~~ from the point of a ground fault on a wiring system to the electrical supply source.

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