NFPA 32
Standard for Drycleaning Plants

1996 Edition

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

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Standard for

Drycleaning Plants

1996 Edition

This edition of NFPA 32, *Standard for Drycleaning Plants,* was prepared by the Technical Committee on Drycleaning and acted on by the National Fire Protection Association, Inc., at its Annual Meeting held May 20–23, 1996, in Boston, MA. It was issued by the Standards Council on July 18, 1996, with an effective date of August 9, 1996, and supersedes all previous editions.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

This edition of NFPA 32 was approved as an American National Standard on July 26, 1996.

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 Dyers and Cleaners. The first edition was adopted by the Association in 1925. Amendments were adopted in 1927; complete revised editions in 1936, 1944, 1954, and 1956; amendments in 1964; a completely revised edition in 1970; amendments in 1972; and completely revised editions in 1974 and 1979. One minor amendment to 2-4.4.4.2 was added in the 1985 edition. The 1985 edition was reconfirmed in 1990.

The 1996 edition has adopted a minor change to the definition of Spotting in Section 1-4.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

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 safeguarding against the fire and explosion hazards associated with drycleaning and associated operations.

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

Information on referenced publications can be found in Chapter 6 and Appendix B.

Chapter 1 General Provisions

1-1 Purpose. This standard is intended to provide reasonable safeguards for the prevention and control of fire and explosion hazards inherent to drycleaning operations and for the protection of employees and the public.

1-2 Scope. This standard shall apply to establishments hereinafter defined as drycleaning plants.

1-3 Retroactivity. Existing plants, equipment, buildings, structures, and installations in compliance with the provisions of a previous edition of this standard in effect at the time of installation shall be permitted to be continued in use, provided that such continuous use does not constitute a distinct hazard to life or adjoining property.

1-4 Definitions.

Approved.* Acceptable to the authority having jurisdiction.

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

Bonded or Grounded. A situation in which either a bond or a ground has been deliberately applied or an electrically conductive path having a resistance adequately low for the intended purpose (usually 10^6 ohms or less) is inherently present by the nature of the installation.

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). Methods of drycleaning include:

(a) Immersion and agitation with the solvent in closed machines.

(b) "Brushing" or "scouring" with cleaning solvents.

(c) Dual-phase processing.

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

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

Drycleaning Units or Drycleaning Machines. Any equipment in which textiles are immersed or agitated in solvent or in which drycleaning solvent is extracted from textiles.

Drying Tumblers. Any equipment in which solvent-cleaned textiles are tumbled, agitated, and dried or deodorized while circulating heated air through the load to remove the solvent. A reclaiming tumbler shall mean a drying tumbler as defined above, which, in addition, reclaims the solvent from vapors.

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

Flash Point.* The minimum temperature of a liquid at which sufficient vapor is given off to form an ignitable mixture with the air near the surface of the liquid or within the vessel used.

Gallon. A U.S. gallon.

Grounded. See Bonded or Grounded.

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.

Listed.* Equipment, materials, or services included in a list published by an organization 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 either that the equipment, material, or service meets identified standards or has been tested and found suitable for a specified purpose.

Shall. Indicates a mandatory requirement.

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

Solvent or Liquid Classification. A method for classifying solvents or liquids as follows:

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

Class II Solvents. Liquids having a flash point at or above 100°F (37.8°C) and below 140°F (60°C).

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

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

Class IV Solvents. Liquids classified as nonflammable.

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

Tank, Storage. A tank used for the storage of new or distilled solvent.

Tank, Treatment. A tank used for settling, filtering, caustic treatment, or other operating purposes.

1-5 Systems. For the purpose of this standard, drycleaning plants or systems are classified as follows:

(a) *Type I.* Systems employing Class I solvents [example: 50°F (10°C) flash point naphtha].

(b) *Type II.* Systems employing Class II solvents and complying with the requirements of Chapter 2 (example: Stoddard solvent).

(c) *Type IIIA.* Systems employing Class IIIA solvents and complying with the requirements of Chapter 3 [example: 140°F (60°C) solvent].

(d) *Type IIIB.* Systems employing Class IIIB liquids and complying with the requirements of Chapter 3 (example: specially compounded oils).

(e) *Type IV.* Systems employing Class IV solvents and complying with the requirements of Chapter 4.

(f) *Type V.* Systems employing Class IV solvents and complying with the requirements of Chapter 5.

1-6 General Requirements and Restrictions.

1-6.1 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 for examination and approval to the authority having jurisdiction. These plans shall be drawn to an indicated scale showing the relative location of 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 their fittings, and other devices.

1-6.2 Type I drycleaning plants or systems shall be prohibited.

1-6.3 Plants employing more than one class of solvent for drycleaning shall comply with the requirements for the numerically lowest class of solvent employed.

1-6.4 Ventilation of all types of plants or systems shall be adequate to protect employees and the public in accordance with applicable government regulations.

1-6.5 Drycleaning by immersion and agitation in open vessels shall be prohibited.

Exception: As provided in 2-4.5.

1-6.6 Drycleaning by immersion and agitation in closed machines shall be performed only with machinery and equipment designed, installed, and operated in accordance with this standard.

1-6.7 The use of solvents with a flash point below that for which a machine is designed shall be prohibited.

1-6.8 Manufacturer's Instructions.

1-6.8.1 Machines shall be furnished by the manufacturers with nameplates indicating the class of solvent for which each machine is designed.

1-6.8.2 Written instructions covering the proper installation and safe operation and use of equipment and solvent shall be given to the buyer.

1-6.9 Operations related to the drycleaning business, such as laundering, scouring, scrubbing, pressing, and ironing, shall not be classed as "other occupancies" for the purpose of this standard.

Chapter 2 Type II Drycleaning Plants

2-1 Application. This chapter shall apply to drycleaning plants or systems utilizing Class II solvents.

2-2 Location and Construction.

2-2.1 The drycleaning building shall be located so that it is accessible from at least one side for fire-fighting and fire control purposes. The drycleaning building shall be located not closer than 10 ft (3.05 m) from the line of adjoining property.

Exception: The 10-ft (3-m) distance shall be permitted to be waived, provided the wall facing the line of adjoining property is a blank wall having a fire resistance rating of not less than 2 hours.

2-2.2 Drycleaning operations shall not be performed in the same building with other occupancies.

2-2.3 Drycleaning and tank storage rooms shall be restricted to the lowest floor level of a building. Such rooms shall not be located below grade or above any other story.

2-2.4 Walls shall be of masonry or noncombustible construction, and wall finish shall be plain or plastered without furring or concealed spaces. (*See 2-2.9.*)

2-2.5 The floors of a drycleaning room shall be of fire-resistive construction with a wearing surface of noncombustible and solvent-resistant material.

2-2.6 The floor or roof and ceiling construction above a drycleaning room shall have a fire resistance rating of not less than 1 hour.

2-2.7 Drainage.

2-2.7.1* A drycleaning room shall be designed with an emergency drainage system to direct solvent leakage and fire protection water to a safe location. This could necessitate the use of curbs, scuppers, or a special drainage system to control the spread of fire.

2-2.7.2 An emergency drainage system, if connected to a public sewer or discharged into a public waterway, shall be equipped with a trap or separator.

2-2.7.3 Drycleaning rooms shall be designed to prevent the normal discharge of solvents to public waterways, public sewers, or adjoining property.

2-2.8* A drycleaning room shall have not less than two doors as a means of egress located at opposite ends of the room, at least one of which shall lead directly outside. Door openings from a drycleaning room shall be provided with noncombustible and solvent-resistant ramps or sills of not less than 3 in. (76.20 mm) in height to retain any solvent accidentally spilled on the floor. A permitted alternative to the sill or ramp is an open-grated trench inside the room at the doorway that drains to a safe location.

2-2.9 Where related operations, such as those permitted by 1-6.9, are performed on the same floor as the drycleaning operations, the drycleaning room shall be separated from the rest of the plant by fire partitions having a fire resistance rating of not less than 2 hours. Any opening in such partition shall be protected by an approved fire door having a fire protection rating of not less than $1^1/_2$ hours.

2-2.10 Drying or deodorizing shall be done either in cabinets or tumblers specifically designed for that purpose or in a separate room. If the drying or deodorizing is done in

such cabinets or tumblers, they shall be permitted to be located inside or adjacent to the drycleaning room. If the drying or deodorizing is done in a separate room, such room shall be constructed with walls, partitions, and ceiling having a fire resistance rating of not less than 2 hours. Openings in walls or partitions of such rooms shall be protected by approved fire doors having a fire protection rating of not less than $1^1/_2$ hours. The room shall be ventilated in accordance with 2-3.1.3. If such a drying room is in a separate building, that building shall conform in all respects to the requirements for the drycleaning room.

2-3 Building Services.

2-3.1 Heating, Ventilation, and Air Conditioning.

2-3.1.1 Heating shall be by steam, hot water, or hot oil only.

2-3.1.2 Boilers shall be located, where possible, in a detached building. 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. Openings into the boiler room shall be at least 10 ft (3.05 m) from any openings into the cleaning room.

2-3.1.3 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 Materials*. A system serving a drycleaning room shall serve no other room. The ventilation system shall have sufficient capacity to exhaust 1 $ft^3/min/ft^2$ per ft^2 (0.4 $m^3/sec/m^2$) of floor area from the drycleaning room to a safe outdoor location.

2-3.1.4 The blades or running rings of exhaust fans shall be of nonferrous metal, and motors for fans shall not be installed in ducts.

2-3.2 Electrical Installations. Electrical equipment and wiring in a Type II drycleaning room shall comply with the provisions of NFPA 70, *National Electrical Code*®, Articles 500 and 501 on hazardous (classified) locations, Class I, Division 2.

2-4 Processes and Equipment.

2-4.1 Storage and Treatment Tanks.

2-4.1.1 Tanks shall be constructed and installed in accordance with NFPA 30, *Flammable and Combustible Liquids Code*, Chapter 2.

Exception: As provided for in this subsection.

2-4.1.2 Tank Vents.

2-4.1.2.1 Storage tanks and atmospheric treatment tanks installed aboveground shall be provided with emergency relief venting to relieve excessive internal pressure caused by exposure fire.

2-4.1.2.2 The total capacity of an emergency venting device, including the capacity of any normal vent, shall not be less than that derived from Table 2-4.1.2.2.

Exception: The airflows specified in Table 2-4.1.2.2 shall be permitted to be multiplied by 0.3 for tanks installed in sprinklered drycleaning rooms.

Table 2-4.1.2.2 Wetted Area versus ft^3/hr (m^3/hr) Free Air at 14.7 psia (101.3 kPa absolute) and 60°F (15.6°C)

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

NOTE: Interpolate for intermediate values.

2-4.1.2.3 The wetted area of a tank or container shall be calculated on the basis of 100 percent of the surface area of the tank.

2-4.1.2.4 Atmospheric tanks shall be limited to pressures not exceeding 2.5 psig (17.2 kPag) under emergency venting conditions.

2-4.1.2.5 In no case shall a vent be less than $1^1/_4$-in. (30-mm) pipe size. The vent of a tank installed inside a building shall terminate outside the building.

2-4.1.3 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. A gauge glass or sight glass that allows the escape of solvent from the tank when broken shall not be used.

2-4.1.4 Solvent storage tanks shall be underground or outside aboveground.

Exception: A maximum of two solvent storage tanks with maximum capacity of 1500 gal (5677.5 L) each shall be permitted to be located unenclosed aboveground inside a drycleaning room.

2-4.1.5 Aboveground treatment and storage tanks inside drycleaning plants shall not exceed a capacity of 1500 gal (5677.5 L) each, and the aggregate capacity that shall be permitted in an unenclosed area shall not exceed 7500 gal (28,387.5 L).

Exception: If operational consideration necessitates that inside aboveground treatment and storage tanks exceed the aggregate capacity of 7500 gal (28,387.5 L), additional inside aboveground tanks shall be permitted only in areas located in accordance with 2-2.3, with drainage as specified in 2-2.7.1, 2-2.7.2, and 2-2.7.3. The area shall be separated from all other areas of the plant by construction having a fire

resistance rating of at least 2 hours. Openings to other areas of the plant shall be provided with noncombustible liquidtight raised sills or ramps at least 4 in. (101.60 mm) in height or their equivalent. Openings shall be provided with approved self-closing fire doors. The room shall be liquidtight where the walls join the floor.

2-4.1.6 An inside storage tank shall be provided with a fill pipe originating outside the building. Fill pipes shall have approved connections and permanent identification of applicable solvent.

2-4.1.7 Aboveground inside storage tanks shall be located as close as practicable to the drycleaning unit(s) to which they are connected.

2-4.1.8 Treatment tanks shall not be used for the storage of new or distilled solvents.

2-4.1.9 Treatment tanks subject to greater than atmospheric pressures shall be designed for a working pressure not less than 15 psig [(1.02 atm) (103.42 kPag)] and shall be built in accordance with the principles of the ASME *Boiler and Pressure Vessel Code*, Section VIII, "Pressure Vessels," Division 1. Such tanks 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. The relief device shall not be smaller than $^3/_4$-in. (20-mm) pipe size and shall discharge into an underground tank or aboveground base tank of a drycleaning unit without a shutoff valve in the line.

2-4.2 Filters.

2-4.2.1* Filters operating above atmospheric pressure shall be ASME-approved pressure vessels or shall be constructed to withstand, without bursting, a pressure of 5 times the maximum allowable working pressure or to withstand, without yielding, a pressure of $2^1/_2$ times the maximum allowable working pressure.

2-4.2.2 Pressure-type filters shall be equipped with a reliable pressure gauge, which shall be regularly checked for accuracy; filters shall not be operated at pressures exceeding those recommended by those manufacturers.

2-4.2.3 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. Such air-bleeding lines shall not discharge into the room.

2-4.2.4 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. The relief device shall not be smaller than $^3/_4$-in. (20-mm) pipe size and shall discharge into an underground tank or aboveground base tank of a drycleaning unit without a shutoff valve in the line.

2-4.3 Pumps, Piping, and Solvent Coolers.

2-4.3.1 The aboveground transfer of solvent between any tank or equipment shall be through closed circuits of iron or steel piping.

2-4.3.2 Brass or bronze valves or fittings shall be permitted to be used.

2-4.3.3 Flexible hoses suitable for the solvent shall be permitted to be used as necessary for low pressure connections not to exceed 5 psig [(0.340 atm) (34.475 kPag)] to vibrating or other than stationary equipment.

2-4.3.4 Low melting point materials, such as aluminum, copper, and brass; materials that soften on fire exposure, such as plastics; or nonductile material, such as cast iron, shall be permitted to be used underground for all flammable and combustible liquids within the pressure and temperature limits of ANSI B31, *Code for Pressure Piping*. Piping, valves, and fittings shall be installed and tested in accordance with NFPA 30, *Flammable and Combustible Liquids Code*.

2-4.3.5 Flow sight glasses, the breakage of which would allow the escape of flammable liquids, shall be of a type not readily damaged by heat and shall be protected reliably against physical damage.

2-4.3.6 Service pumps shall be provided to remove sludge from underground tanks. The suction pipe shall be carried to the tank bottom, and the pump shall discharge to a suitable container. In no case shall the discharge be into a sewer.

2-4.3.7 All pumps handling solvent shall be designed for use with flammable liquids. 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.

2-4.3.8 For static protection on pumps and piping installations, see 2-4.6.

2-4.3.9 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 90°F (32.2°C). Visual and audible alarm devices shall be provided to warn the operator when the solvent temperature exceeds 90°F (32.2°C).

2-4.4 Drycleaning Units, Stills, Drying Cabinets, and Tumblers.

2-4.4.1 General. All solvent-handling equipment and components thereof shall be constructed to prevent solvent leakage.

2-4.4.2 Drycleaning Units.

2-4.4.2.1 Drycleaning units shall be of substantial construction to prevent distortion of their components and to prevent objectionable vibration while the machines are in normal operation. The units shall be attached to the floor securely or, if necessary, to special foundations to minimize transmission of vibration to surrounding areas.

2-4.4.2.2 Drycleaning units shall be provided with doors or covers that prevent solvent from splashing on the floor. The door shall be interlocked to prevent rotation of the cylinder or basket while the doors are open or to prevent opening of the doors while the cylinder is rotating; the interlock shall, however, allow rotation of the cylinder at slow speed.

2-4.4.2.3 If drycleaning units are equipped with automatic controls, a manual push button to stop the machine shall be provided in front of the unit.

2-4.4.2.4 Drycleaning units shall be provided with a suitable device that shuts off the solvent inlet supply to the machine in the event the solvent level in the machine reaches the bottom of the trunnion shaft.

2-4.4.2.5 Drycleaning units shall be equipped with brakes or other suitable means to stop the machine within a reasonable time. Brakes shall be designed to avoid the creation of sparks or excessive heat.

2-4.4.2.6 An overflow means below the maximum level, connected to an underground tank by a pipe at least one size larger than the inlet solvent pipe to the machine, and without a shutoff valve shall be considered to be in compliance with the requirements of this section.

2-4.4.2.7 Individual button or lint traps shall be provided with drycleaning units and shall be located between the machine drain and the storage tank.

2-4.4.2.8 The solvent inlet pipe into a drycleaning unit shall be arranged to deflect the solvent stream away from the door opening.

2-4.4.2.9 Drycleaning units shall be constructed with sufficient 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.

2-4.4.2.10 Drycleaning units shall be furnished with one or more suitably placed nameplates indicating the following:

(a) Minimum allowable solvent flash point;

(b) Maximum allowable cylinder speed;

(c) Warnings that the unit shall not be operated with a solvent having a flash point less than that indicated or operated in excess of the indicated cylinder speed; and

(d) Warnings that the door shall not be opened until the cylinder has come to a complete stop.

2-4.4.3 Stills.

2-4.4.3.1 Only steam, hot water, or hot oil shall be used as the source of heat. If steam is used, a pressure-regulating valve shall be installed in the steam supply line to the still.

2-4.4.3.2 Stills shall be liquidtight and gastight.

2-4.4.3.3 Stills shall be designed for operation based on the vacuum principle.

2-4.4.3.4 If a relief valve is provided, it shall be equipped with a vent line extending to the outside.

2-4.4.3.5 A check valve shall be installed in the steam line between the boiler and the still.

2-4.4.3.6 Each still shall be provided with a combination vacuum and pressure gauge.

2-4.4.3.7 Each still shall be equipped with an automatic valve to maintain the solvent level in the still at the proper height.

2-4.4.4 Drying Cabinets and Tumblers.

2-4.4.4.1 Drying cabinets and drying tumblers shall comply with the preceding requirements.

2-4.4.4.2 Drying tumblers shall be of substantial construction, well secured to substantial foundations, and shall be provided with self-closing explosion hatches having an area equal to at least $^1/_3$ ft^2/30 ft^3 (0.03 m^2/0.85 m^3) of cylinder volume. Hatches shall be arranged to open away from the operator.

Exception: For reclaiming tumblers, the venting ratio shall be 1 ft^2/15 ft^3 (1 m^2/4.3 m^3) of cylinder volume.

2-4.4.4.3 Drying cabinets and drying tumblers shall be ventilated to the outside air by means of properly constructed pipes or ducts connected to an exhaust fan of sufficient capacity to remove all dust, vapors, or lint generated by the process. Such discharge pipes or ducts shall be carried to a height of not less than 6 ft (1.83 m) above the roof and shall be provided with clean-out facilities.

2-4.4.4.4 Discharge pipes shall not terminate within 10 ft (3.05 m) measured horizontally from any door, any window, or the frame walls of any adjoining or adjacent building.

2-4.4.4.5 The fan shall be properly housed and interlocked to ensure operation while the drying tumbler is in use. The fan, blades, or running rings shall be constructed of nonferrous metal. In no case shall the fan motor be mounted within the ventilating duct.

2-4.4.4.6 Only steam, hot water, or hot oil shall be used to obtain the necessary temperatures in the drying tumblers or cabinet.

2-4.5 Scouring, Brushing, and Spotting.

2-4.5.1 All scouring, brushing, and spotting or prespotting shall be conducted with nonflammable solvents or with Class II or Class III liquids or solvents.

Exception: These operations shall be permitted to be conducted with Class I solvents, provided they are stored in approved safety cans or in sealed DOT-approved metal shipping containers of not more than 1 gal (3.8 L) capacity. Dispensing shall be from approved safety cans.

2-4.5.2 The brushing or prespotting table on which articles are soaked in solvent shall have a liquidtight top with a curb on all sides not less than 1 in. (25.4 mm) high. The top of the table shall be pitched to ensure thorough draining to a $1^1/_2$-in. (38-mm) drain connected to a suitable container especially provided and marked for the purpose.

2-4.5.3 The scouring or brushing table or scrubbing tub shall be located to ensure thorough and effective disposal of solvent vapors through the ventilating system.

2-4.5.4 Articles that cannot be washed in the usual washing machines shall be permitted to be cleaned on scouring or brushing tables or in scrubbing tubs, provided the total amount of solvent used in such open containers does not exceed 3 gal (11.6 L). Scrubbing tubs shall be secured to the floor and shall be provided with permanent $1^1/_2$-in. (38-mm) trapped drains to a suitable container especially provided and marked for the purpose.

2-4.5.5 Metal scrubbing tubs and metal tops of spotting tables shall be permanently and effectively grounded.

2-4.6 Static Electricity.

2-4.6.1* 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. Isolated units of equipment shall be grounded.

2-4.6.2* Special consideration shall be given to the generation and accumulation of static electricity where loading fabrics into or removing fabrics from drycleaning units. Where fabrics are transferred from one piece of equipment to another, the two pieces of equipment shall be electrically bonded together.

2-4.7 Operating Requirements.

2-4.7.1 Machines shall be operated in accordance with operating instructions furnished by the machinery manufacturer. All employees shall be thoroughly instructed with regard to the hazards involved in their departments, work they perform, and the locations of switches to cut off the flow of solvents.

2-4.7.2 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.

2-4.7.3 In removing materials from the washer, provisions shall be made for minimizing the dripping of solvent on the floor. Where materials are transferred from a washer to a drain tub, a nonferrous metal drip apron shall be placed so that it rests on the drain tub and the cylinder of the washer.

2-4.7.4 The lint and refuse shall be removed from all traps after the close of the day's work, deposited in approved waste cans, removed from the premises, and disposed of safely. At all other times, the trap covers shall be securely in place.

2-4.7.5 Proper maintenance and operating practices that help prevent leakage or accidental escape of solvent and the accumulation of lint shall be followed.

2-4.7.6 Flammable or combustible liquids shall not be used for cleaning floors.

2-4.7.7 The repairing and cleaning of tanks shall be performed in accordance with NFPA 327, *Standard Procedures for Cleaning or Safeguarding Small Tanks and Containers Without Entry.*

2-5 Fire Control.

2-5.1 A building housing the drycleaning room shall be protected throughout by an approved automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.*

2-5.2 Drycleaning units and washer-extractors shall be provided with an automatic carbon dioxide extinguishing system installed and maintained in accordance with NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems,* or, if acceptable to the authority having jurisdiction, a manual steam jet not less than $^3/_4$ in. (19 mm) with a continuously available steam supply at a pressure of not less than 15 psig (0.72 kPag).

2-5.3 Each drying tumbler shall be provided with an approved carbon dioxide or steam injection extinguishing system arranged to operate automatically in case of fire in the tumbler.

2-5.4 Suitable portable fire extinguishers shall be provided throughout the drycleaning plant in accordance with NFPA 10, *Standard for Portable Fire Extinguishers.*

2-5.5 Not less than two approved 10 B:C portable fire extinguishers shall be provided near the doors inside a drycleaning room.

2-5.6 In order that the reliable operation of steam or other extinguishing systems is ensured, periodic inspection of all valves and piping shall be made.

2-5.7 Smoking in a drycleaning room shall be strictly prohibited. "No smoking" signs shall be posted.

Chapter 3 Type III Drycleaning Plants

3-1 Type IIIA Drycleaning Plants.

3-1.1 Application. Drycleaning plants or systems utilizing only Class IIIA solvents shall comply with Chapter 2.

Exception: As modified by the provisions in this section.

3-1.2 General Restriction. Solvents other than Class IIIA shall not be used.

Exception: As explicitly permitted by applicable requirements cited in 2-4.5.

3-1.3 Special Provisions.

3-1.3.1 Type IIIA drycleaning plants located in a building with other occupancies shall be protected by an approved automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems,* and shall be separated vertically and horizontally from other occupancies by partitions having a fire resistance rating of not less than 2 hours. All vertical and horizontal openings to other occupancies shall be protected by approved automatic fire doors having a fire protection rating of not less than $1^1/_2$ hours.

3-1.3.2 In Type IIIA drycleaning plants located in buildings with no other occupancies, the drycleaning room shall be separated from the rest of the plant by partitions having a fire resistance rating of not less than 2 hours with all openings to the rest of the plant protected by approved automatic fire doors having a fire protection rating of not less than $1^1/_2$ hours.

Exception: If the entire building is protected by an approved automatic sprinkler system, the drycleaning room shall not be required to be separated.

3-1.3.3 The electrical equipment and wiring of a Type IIIA plant or system shall comply with the provisions of NFPA 70, *National Electrical Code*, for ordinary locations.

Exception: For stills or drying tumblers in which the solvent is ordinarily heated above the flash point, the electrical components and wiring on such equipment shall be in accordance with NFPA 70, National Electrical Code, Articles 500 and 501, Class I, Division 2.

3-1.3.4 Storage tanks, treatment tanks, and filters shall comply with the requirements of Section 2-4.

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

3-2 Type IIIB Drycleaning Plants.

3-2.1 Application. Section 3-2 shall apply to plants or systems utilizing Class IIIB liquids.

3-2.2 General Restriction. Class IIIB liquids used in these systems shall not be heated to a temperature in excess of 30°F (–1.7°C) below their flash point.

3-2.3 Requirements.

3-2.3.1 Type IIIB plants or systems located in buildings with other occupancies shall be separated vertically and horizontally from such other occupancies by partitions having a fire resistance rating of not less than 2 hours. All vertical and horizontal openings to other occupancies

shall be protected by approved automatic fire doors having a fire protection rating of not less than $1^1/_2$ hours.

Exception: If the entire building is protected by an approved automatic sprinkler system, the Type IIIB plant or system shall not be required to be separated.

3-2.3.2 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.

3-2.3.3 Storage tanks, treatment tanks, and filters shall comply with the requirements of Section 2-4.

Exception: The capacity of any inside aboveground tank shall not exceed 2500 gal (9463 L), and the aggregate capacity of all inside aboveground storage and treatment tanks in an unenclosed area shall not exceed 7500 gal (28,388 L). Capacities in excess of 7500 gal shall be located in a separate room as permitted by the exception to 2-4.1.5.

Chapter 4 Type IV Drycleaning Plants

4-1 General.

4-1.1 Application.

4-1.1.1 This chapter shall apply to drycleaning plants or systems utilizing Class IV solvents.

4-1.1.2 The provisions of this chapter shall apply to Type IV drycleaning plants and systems located in buildings with or without other occupancies in which the drycleaning is not conducted by the public.

4-1.1.3 Only Class IV solvents shall be used in any drycleaning machine or system designed for such solvents.

Exception: If other solvents are used in the machines, the plant status shall be changed to comply with the sections of this standard applicable to the rating of the most hazardous solvents used other than as required in 4-4.5.

4-1.2 Type IV plants shall be designed, installed, and operated to reduce to a reasonable and acceptable degree the toxicity or health hazards incident to the nature of the solvents.

4-2 Location and Construction. No requirements.

4-3 Building Services.

4-3.1 Ventilation, Heating, and Air Conditioning.

4-3.1.1 Type IV plants shall be provided with ventilation adequate to maintain an average solvent concentration anywhere within the plant as follows:

(a) For plants using perchloroethylene, not more than 100 ppm;

(b) For plants using fluorocarbon 113 (trichlorotrifluoroethane), not more than 1000 ppm.

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

4-3.1.2 Air for combustion for gas-fired and oil-fired devices shall come through ducts from a clean source of air outside the building where such devices are located in the drycleaning room.

4-3.1.3 Apparatus with open flames or with exposed electric heating elements shall be protected from any equipment using Class IV solvents by providing:

(a) Exterior intakes for combustion air.

(b) Exhaust vents from the drycleaning equipment to extend beyond the roof at a location remote from the air intakes.

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 towards the apparatus.

4-3.1.4 The exhaust ventilation outlets shall be located not closer than 25 ft (7.63 m) from any openings in other occupancies.

4-3.2 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.

4-4 Processes and Equipment.

4-4.1 General.

4-4.1.1 All solvent-handling equipment and components shall be constructed to prevent leakage.

4-4.1.2 Solvent storage and treatment tanks and all interior steel surfaces that tend to corrode when exposed during ordinary operation alternately to solvent and to air shall be protected against corrosion. Pumps, filters, or any closed containers that ordinarily are completely filled with solvent, or 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.

4-4.1.3 Exhaust ventilation ducts from equipment shall be sealed, taped, or soldered, and the discharge shall extend above the roofline unless leading directly into a solvent recovery system.

4-4.2 Filters. Filters shall comply with the requirements of 2-4.2.

4-4.3 Pumps and Piping.

4-4.3.1 The transfer or circulation of solvent shall be through closed circuit pipes.

4-4.3.2 Pumps shall be used for the transfer of solvent.

Exception: Pumps shall be permitted to be used for gravity flow through pipes.

4-4.3.3 Pipes, tubings, valves, and sight glasses shall be 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.

4-4.3.4 Flow and level sight glasses shall be protected reliably against physical damage.

4-4.3.5 All pumps shall be designed for the solvent being used and shall be provided with seals proven to be leakproof in solvent operation. Positive displacement pumps for solvent service shall be fitted with relief valves or bypasses set to prevent pressure in excess of the working pressure of the system.

4-4.4 Drycleaning Units and Stills.

4-4.4.1 Drycleaning units shall comply with the requirements of 2-4.4.2 and 4-4.1.1.

4-4.4.2 Drycleaning units shall be provided with an automatically activated exhaust ventilation system to maintain a minimum of 100 ft/min (30.5 m/sec) air velocity through the loading door whenever the door is open. An external ventilation shroud immediately outside the loading door shall be permitted to be used, provided the airflow capacity in ft^3/min is not less than 100 times the area of the door opening in ft^2 (9.3 times the area in m^2).

Exception: This requirement shall not apply to drycleaning units using fluorocarbon 113 (trichlorotrifluoroethane), provided that the operator is not exposed to an average solvent concentration during loading and unloading in excess of 1000 ppm.

4-4.4.3 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.

4-4.4.4 Stills shall be equipped with solvent aftercoolers to lower the distilled solvent temperature to less than 100°F (37.8°C) before returning the solvent to the drycleaning system.

4-4.4.5 Water separators shall be provided on stills to reduce the amount of water entrapped with the distilled solvent.

4-4.4.6 Stills shall be equipped with a thermostatically controlled valve on the inlet steam line. The valve shall close automatically when the waterflow through the condensor is shut off or when the temperature of the cooling water leaving the condensor exceeds 160°F (71.1°C) for perchloroethylene and 95°F (35°C) for fluorocarbon 113 (trichlorotrifluoroethane).

4-4.5 Spotting. Flammable and combustible liquids used for spotting operations shall be stored in approved safety cans or in sealed DOT-approved metal shipping containers of not more than 1 gal (3.785 L) capacity. Dispensing shall be from approved safety cans. Aggregate amounts shall not exceed 10 gal (37.85 L).

4-4.6 Operating Requirements.

4-4.6.1 Machines shall be operated in accordance with operating instructions furnished by the machinery manufacturer. All employees shall be thoroughly instructed as to the hazards involved in their departments and in the work they perform.

4-4.6.2 Proper maintenance and operating practices for the entire drycleaning plant shall be followed in order to prevent the leakage of solvent and the accumulation of lint.

4-5 Fire Control.

4-5.1 Suitable portable fire extinguishers shall be provided throughout the drycleaning plant in accordance with NFPA 10, *Standard for Portable Fire Extinguishers.*

4-5.2 Not less than two approved 10 B:C portable fire extinguishers shall be provided near the doors inside a drycleaning room.

4-5.3 Other special fire prevention regulations for control of the solvents shall not be required.

Chapter 5 Type V Operations

5-1 General.

5-1.1 Application. This chapter shall apply to drycleaning stores or systems utilizing Class IV solvents in which the drycleaning is conducted by the public.

5-1.2 Type V operations shall be designed, installed, and operated to reduce to a reasonable and acceptable degree the health hazards inherent to the nature of the solvents.

5-1.3 Only solvents approved for Type V installations shall be used in the drycleaning machines.

5-2 Building Services.

5-2.1 Heating, Ventilation, and Air Conditioning.

5-2.1.1 Type V operations shall be provided with adequate ventilation. There shall be a minimum airflow rate directed away from the customer areas as provided in Table 5-2.1.1.

Table 5-2.1.1 Minimum Airflow for Type V Operations

Number of Drycleaning Units	Airflow per Unit	
	(ft^3/min)	(m^3/sec)
1–3	250	0.118
4–8	200	0.094
9–16	150	0.071
17 or more	100	0.047

The exhaust ventilation shall be provided continuously while the store is open for business. The exhaust fan shall be interlocked so that the drycleaning units cannot be operated unless the fan is in operation. A supply of makeup air equal to or greater than the total volume of air exhausted shall be provided for the customer area.

5-2.1.2 A ventilation fan shall be installed in the service area for use in case of a serious solvent leak. The combined capacity of the ventilation required in 5-2.1.1 and this fan shall be not less than 500 ft^3/min (236 L/sec) per drycleaning machine.

5-2.1.3 The limits for concentration of solvent vapor shall not exceed 100 ppm for perchloroethylene and 1000 ppm for fluorocarbon 113 (trichlorotrifluoroethane).

5-2.1.4 The exhaust ventilation outlets shall be located not closer than 25 ft (7.62 m) from any openings in other occupancies.

5-2.1.5 Air for combustion for gas-fired and oil-fired devices shall come through ducts from a clean source of air outside the building where such devices are located in the drycleaning room.

5-2.2 All electrical devices and wiring shall be installed in accordance with the requirements of NFPA 70, *National Electrical Code*, for general purpose use.

5-3 Processes and Equipment.

5-3.1 Filters. Filters shall comply with the requirements of 2-4.2 and 4-4.1.

5-3.2 Pumps and Piping. Pumps and piping shall comply with the requirements of 4-4.3.

5-3.3 Drycleaning Units and Stills.

5-3.3.1 Drycleaning units and stills shall comply with the requirements of 4-4.4.

5-3.3.2 Only the front (customer) side of the drycleaning unit shall be exposed in the customer area. The working or maintenance portion of the units shall be located in a service area and separated by an approved partition. Access doors to the service area shall be kept locked.

5-3.3.3 Drycleaning units shall be provided with an automatically activated exhaust ventilation system to maintain a minimum of 100 ft/min (0.005 m/sec) air velocity through the loading door whenever the door is open.

Exception: This requirement shall not apply to drycleaning units using fluorocarbon 113 (trichlorotrifluoroethane), provided that the operator is not exposed to an average solvent concentration during loading and unloading in excess of 1000 ppm.

5-3.3.4 A satisfactory means of preventing solvent leaks from escaping the drycleaning units area shall be provided. A curb on the floor near the base of the unit or a metal pan around the unit shall be provided that holds a volume of liquid equal to the maximum quantity of solvent in the unit.

5-3.3.5 Stills shall be constructed to prevent hot solvent vapor from escaping into the room.

5-3.3.6 An interlock system shall be provided to prevent the loading door of the unit from being opened during the entire drycleaning cycle.

5-3.3.7 The unit shall be designed so that no significant amount of solvent is left in the cleaned garments at the end of the drying cycle.

5-3.4 Spotting operations using flammable or combustible liquids shall not be permitted.

5-3.5 Operating Requirements.

5-3.5.1 Operating instructions for customer use shall be posted in a conspicuous location near the unit. A telephone number shall be provided for emergency assistance.

5-3.5.2 Proper maintenance of the drycleaning units shall be provided daily to prevent solvent leakage and lint accumulation.

5-3.5.3 Filter residue and other residues containing solvent shall be handled and disposed of in covered metal containers.

5-3.5.4 Customer areas shall be kept clean.

5-4 Fire Control. Suitable portable fire extinguishers shall be provided throughout in accordance with NFPA 10, *Standard for Portable Fire Extinguishers.*

Chapter 6 Referenced Publications

6-1 The following documents or portions thereof are referenced within this standard and shall be considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

6-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers,* 1994 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems,* 1993 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 1996 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* 1996 edition.

NFPA 70, *National Electrical Code,* 1996 edition.

NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems,* 1996 edition.

NFPA 91, *Standard for Exhaust Systems for Air Conveying of Materials,* 1995 edition.

NFPA 327, *Standard Procedures for Cleaning or Safeguarding Small Tanks and Containers Without Entry,* 1993 edition.

6-1.2 Other Publications.

6-1.2.1 ANSI Publication. American National Standards Institute, 1430 Broadway, New York, NY 10017.

ANSI B31, *Code for Pressure Piping.*

6-1.2.2 ASME Publication. American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10017.

ASME *Boiler and Pressure Vessel Code,* 1995 edition.

Appendix A Explanatory Material

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

A-1-4 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 concerned with product evaluations that is in a position to determine compliance with appropriate standards for the current production of listed items.

A-1-4 Authority Having Jurisdiction. The phrase "authority having jurisdiction" is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A-1-4 Flash Point. The appropriate test procedure and apparatus follow:

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

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

A-1-4 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A-2-2.7.1 Appendix A of NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, provides information on such protection.

A-2-2.8 For means of egress requirements, see NFPA *101®, Life Safety Code®*.

A-2-4.2.1 See Section VIII, "Pressure Vessels," Division 1, of the ASME *Boiler and Pressure Vessel Code* for test methods.

A-2-4.6.1 For further information, see NFPA 77, *Recommended Practice on Static Electricity.*

A-2-4.6.2 For further information, see NFPA 77, *Recommended Practice on Static Electricity.*

Appendix B Referenced Publications

B-1 The following documents or portions thereof are referenced within this standard for informational purposes only and thus are not considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

B-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection,* 1996 edition.

NFPA 77, *Recommended Practice on Static Electricity*, 1993 edition.

NFPA *101*, *Life Safety Code,* 1994 edition.

B-1.2 Other Publications.

B-1.2.1 ASME Publication. American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10017.

ASME *Boiler and Pressure Vessel Code,* 1995 edition.

B-1.2.2 ASTM Publications. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D 56, *Standard Test Method for Flash Point by Tag Closed Tester*, 1993.

ASTM D 93, *Standard Test Methods for Flash Point by Pensky–Martens Closed Cup Tester*, 1994.