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NFPA 32 Drycleaning Plants 1990 Edition

National Fire Protection Association 1 Batterymarch Park, Quincy, MA 02269-9101

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The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

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NFPA 32

Standard for

Drycleaning Plants

1990 Edition

This edition of NFPA 32, *Standard for Drycleaning Plants*, was prepared by the Technical Committee on Drycleaning, released by the Correlating Committee on Flammable Liquids, and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 13-15, 1989 in Seattle, WA. It was issued by the Standards Council on January 12, 1990, with an effective date of February 5, 1990, and supersedes all previous editions.

The 1990 edition of this document has been approved by the American National Standards Institute.

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 paragraph 2-4.4.4.2 was added in the 1985 edition.

This 1990 edition is a reconfirmation of the 1985 edition.

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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.

Contents

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Standard for

Drycleaning Plants

1990 Edition

NOTICE: Information on referenced publications can be found in Chapter 6 and Appendix A.

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 incident to drycleaning operations and for the protection of the employees and the public.

1-2 Scope. This standard applies 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 may 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."

NOTE: 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 or 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 which is in a position to determine compliance with appropriate standards for the current production of listed items.

Authority Having Jurisdiction. The "authority having jurisdiction" is the organization, office or individual responsible for "approving" equipment, an installation or a procedure.

NOTE: 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, 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 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."

Bonded or Grounded. 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 wearing apparel, textiles, fabrics, rugs, etc., 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 office, receiving, and storage rooms.

Drycleaning Room. A room in which the drycleaning operations are conducted, including all additional sections 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 ignitible mixture with the air near the surface of the liquid or within the vessel used.

NOTE: 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), shall be determined in accordance with ASTM D-56-82, *Standard Method of Test for Flash Point by the 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 shall be determined in accordance with ASTM D-93-80, *Standard Method of Test for Flash Point by the Pensky-Martens Closed Tester.*

Gallon. A U.S. gallon.

Grounded. *See Bonded.*

Labeled. Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization 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 or materials included in a list published by an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

NOTE: 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.

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 according to the following classes:

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 solvent to spots of dirt, grease, paints, and 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 arranged in the following types:

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

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

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

Type IIIB — Systems employing Class IIIB liquids and complying with the requirements of Chapter 3. [Example: specially compounded oils.]

Type IV — Systems employing Class IV solvents and complying with the requirements of Chapter 4.

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 relative location of drycleaning building; boiler room; finishing building or departments; storage tanks for solvents, pumps, washers, drying tumblers, filters, stills, processing tanks, interconnecting piping, etc.; and shall show sectional elevation of the buildings including lowest floors, pits, tanks, their fittings, devices, etc.

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 carried on 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 Manufacturers' 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 shall be given to the buyer, covering proper installation and safe operating methods of using equipment and solvent.

1-6.9 Operations related to the drycleaning business, such as laundering, scouring, scrubbing, pressing, ironing, etc., 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) to the line of adjoining property.

Exception: The distance may be waived if the wall facing the line of adjoining property is a blank wall having a fire resistance rating of not less than two hours.

2-2.2 Drycleaning operations shall not be carried on 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 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 one hour.

2-2.7 Drainage.

2-2.7.1 A drycleaning room shall be designed to provide an emergency drainage system to direct solvent leakage and fire protection water to a safe location. This may require curbs, scuppers, or a special drainage system to control the spread of fire. Appendix A of NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, provides information on such protection.

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. (*For means of egress requirements, see NFPA 101®, Life Safety Code.®*) 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 permissible alternate to the sill or ramp is an open-grated trench inside the room at the doorway, which drains to a safe location.

2-2.9 Where related operations, such as permitted by 1-6.9, are done on the same floor as the drycleaning operations, the drycleaning room shall be cut off from the rest of the plant by fire partitions having a fire resistance rating of not less than two hours. Any opening in such partition shall be protected by an approved fire door suitable for Class B openings.

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 may 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 two hours. Openings in walls or partitions of such rooms shall be protected by approved fire doors suitable for Class B openings. The room shall be ventilated in accordance with 2-3.1.3. If such 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, when possible, in a detached building. When in the same building and in a room adjoining the drycleaning room, the boiler room shall be cut off by fire partitions, without openings, having a fire resistance rating of not less than two 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 the Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying*. A system serving a drycleaning room shall serve no other room. The ventilation system shall have sufficient capacity to exhaust 1 cfm per sq ft (0.4 $m^3/s/m^2$) 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 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, except as otherwise provided.

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 that may be 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.

Exception: The air flows specified in Table 2-4 may be multiplied by 0.3 for tanks installed in the sprinklered drycleaning rooms.

Table 2-4 Wetted Area Versus Cubic Feet Free Air per Hour 14.7 psia and 60°F (15.6°C)

sq ft	cfh	sq ft	cfh	sq ft	cfh
20	21,100	70	73,700	120	126,000
30	31,600	80	84,200	140	147,000
40	42,100	90	94,800	160	168,000
50	52,700	100	105,000	180	190,000
60	63,200			200	211,000

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 kPa) under emergency venting conditions.

2-4.1.2.5 In no case shall a vent be less than 1¼-in. 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 gaging device designed and installed so that solvent or vapors will not be discharged into the building during normal service. A gage glass or sight glass that when broken will permit the escape of solvent from the tank shall not be used.

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

Exception: Not more than two solvent storage tanks with a capacity not to exceed 1,500 gal (5 677.5 L) each may 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 1,500 gal (5 677.5 L) each and the aggregate capacity permitted in an unenclosed area shall not exceed 7,500 gal (28 387.5 L).

Exception: If operational consideration requires that inside aboveground treatment and storage tanks exceed the aggregate capacity of 7,500 gal (28 387.5 L), additional inside aboveground tanks are 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 two 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 the 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 with 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 kPa) and shall be built in accordance with the principles of the *ASME Boiler and Pressure Vessel Code*, Section VIII, Pressure Vessels, Division 1, 1983 Edition. Such tanks shall be equipped with a pressure relief device that will prevent 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 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.

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 2½ times the maximum allowable working pressure. (*See Section VIII, Pressure Vessels, Division 1, 1983 Edition of the ASME Boiler and Pressure Vessel Code for test methods.*)

2-4.2.2 Pressure-type filters shall be equipped with a reliable pressure gage, which shall be regularly checked for accuracy; filters shall not be operated at pressures exceeding that recommended by the 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 pressure relief devices that will prevent 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 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.

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 may be used.

2-4.3.3 Flexible hoses suitable for the solvent may be used as required for low pressure connections not to exceed 5 psig (0.340 atm) (34.475 kPa) 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, may be used underground for all flammable and combustible liquids within the pressure and temperature limits of ANSI B31, *American National Standard Code for Pressure Piping*. Piping, valves, and fittings shall be installed and tested according to NFPA 30, *Flammable and Combustible Liquids Code*.

2-4.3.5 Flow sightglasses, the breakage of which would permit the escape of flammable liquids, shall be of a type not readily damaged by heat and shall be reliably protected 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 so as 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 When 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 securely attached to the floor 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 rotating 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, permit rotating 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 will shut 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 reasonable time. Brakes shall be designed to avoid creation of sparks or excessive heat.

2-4.4.2.6 An overflow means below the maximum level and 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, 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 all 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 stated or operated in excess of such cylinder speed

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

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 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 gage.

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 sq ft for each 30 cu ft (0.03 m^2 per 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 sq ft (0.09 m^2) for every 15 cu ft (0.4 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, window, or frame walls of any adjoining or adjacent building.

2-4.4.4.5 The fan shall be properly housed and so interlocked as 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 may be conducted with Class I solvents if 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 so as to ensure thorough draining to a 1 1/2-in. (38 mm) drain connected to a suitable container especially provided and marked for that purpose.

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

2-4.5.4 Articles, the character of which prevents their washing in the usual washing machines, may be cleaned on scouring or brushing tables or in scrubbing tubs provided the total amount of solvent used in such open containers shall 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 that 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. (*For further information, see NFPA 77, Recommended Practice on Static Electricity.*)

2-4.6.2 Special consideration shall be given to the generation and accumulation of static electricity when loading fabrics into or removing fabrics from drycleaning units. When fabrics are transferred from one piece of equipment to another, the two pieces of equipment shall be electrically bonded together. (*For further information, see NFPA 77, Recommended Practice on Static Electricity.*)

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 as to the hazards involved in their departments, in the 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 thoroughly searched in the receiving room and all foreign materials, especially matches and metallic substances, removed.

2-4.7.3 In removing materials from the washer, provisions shall be made for minimizing the dripping of solvent on the floor. When materials are transferred from a washer to a drain tub, a nonferrous metal drip apron shall be placed so as to rest 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 shall be adhered to which will tend to prevent leakage or accidental escape of solvent and the accumulation of lint.

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*.

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 ¾ in. (19 mm) with a continuously available steam supply at a pressure of not less than 15 psig (0.72 kPa).

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-BC portable fire extinguishers shall be provided inside a drycleaning room, near the doors.

2-5.6 In order that reliable operation of steam or other extinguishing systems may be assured, 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, 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 cut off vertically and horizontally from such other occupancies by partitions having a fire resistance rating of not less than two hours. All vertical and horizontal openings to other occupancies shall be protected by approved automatic fire doors suitable for Class B openings.

3-1.3.2 In Type IIIA drycleaning plants located in buildings with no other occupancies, the drycleaning room shall be cut off from the rest of the plant by partitions having a fire resistance rating of not less than two hours with all openings to the rest of the plant protected by approved automatic fire doors suitable for Class B openings.

Exception: If the entire building is protected by an approved automatic sprinkler system, the drycleaning room need not be cut off.

3-1.3.3 Electrical equipment and wiring of a Type IIIA plant or systems 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 (1 250 L), and the total solvent capacity of such plant, including inside aboveground and underground storage tanks, shall not exceed 1,320 gal (4 996 L).

3-2 Type IIIB Drycleaning Plants.

3-2.1 Application. Section 3-2 applies 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 located in buildings with other occupancies shall be cut off vertically and horizontally from such other occupancies by partitions having a fire resistance rating of not less than two hours. All vertical and horizontal openings to other occupancies shall be protected by approved automatic fire doors suitable for Class B openings.

Exception: If the entire building is protected by an approved automatic sprinkler system, the Type IIIB plant or system need not be cut off.

3-2.3.2 Electrical equipment and wiring in a Type IIIB plant 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 2,500 gal (9 463 L) and the aggregate capacity of all inside aboveground storage and treatment tanks in an unenclosed area shall not exceed 7,500 gal (28 388 L). Capacities in excess of 7,500 gal shall be located in a separate room as required in 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 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 permitted in 4-4.5.

4-1.2 Type IV plants shall be so designed, installed, and operated as 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 of: For plants using perchloroethylene, not more than 100 ppm; for plants using fluorocarbon 113 (trichlorotrifluoroethane), not more than 1,000 ppm. Manually operated emergency ventilation for spills or leaks shall be installed to provide an air change every five 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- and oil-fired devices shall come through ducts from a clean source of air outside the building when 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 to solvent and to air alternately shall be protected against corrosion. Pumps, filters, or any closed containers that ordinarily are completely filled with solvent, or steam coils or chests immersed in solvent or that ordinarily do not tend to corrode, may 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 roof line 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: For gravity flow through pipes.

4-4.3.3 Pipes, tubings, valves, and sightglasses shall be of materials suitable for use with the solvent and shall be tested for minimum pressure of 50 percent in excess of the maximum operating pressure.

4-4.3.4 Flow and level sightglasses shall be reliably protected 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 fpm (30.5 m/s) air velocity through the loading door whenever the door is open. An external ventilation shroud immediately outside the loading door may be used provided the airflow capacity in cfm is not less than 100 times the area in square feet of the door opening.

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 1,000 ppm.

4-4.4.3 Atmospheric solvent stills shall be constructed to prevent hot solvent vapor from escaping into the room when 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. Such valve shall be automatically closed when the water flow 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 adhered to in order to prevent 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-BC portable fire extinguishers shall be provided inside a drycleaning room, near the doors.

4-5.3 Other special fire prevention regulations for control of the solvents are not 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 so designed, installed, and operated to reduce to a reasonable and acceptable degree the health hazards incident 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 air flow rate away from the customer areas as follows:

Number of Drycleaning Units	Air Flow per Unit-cfm
1-3	250
4-8	200
9-16	150
17 or more	100

(NOTE: 1 cfm = 0.47 L/s)

This 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 to be used 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 cfm (236 L/s) per drycleaning machine.

5-2.1.3 The limits for concentration of solvent vapor shall not exceed 100 ppm for perchloroethylene, and 1,000 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- and oil-fired devices shall come through ducts from a clean source of air outside the building when 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 separated in a service area 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 fpm (0.005 m/s) 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 1,000 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 which will hold the volume of liquid equal to the maximum quantity of solvent in the unit.

5-3.3.5 Stills shall be constructed so as 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 listed 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 10-1988, *Standard for Portable Fire Extinguishers*

NFPA 12-1989, *Standard on Carbon Dioxide Extinguishing Systems*

NFPA 13-1989, *Standard for the Installation of Sprinkler Systems*

NFPA 15-1985, *Standard for Water Spray Fixed Systems for Fire Protection*

NFPA 30-1987, *Flammable and Combustible Liquids Code*

NFPA 70-1990, *National Electrical Code*

NFPA 90A-1989, *Standard for the Installation of Air Conditioning and Ventilating Systems*

NFPA 91-1990, *Standard for the Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying*

NFPA *101*-1988, *Code for Safety to Life from Fire in Buildings and Structures*

NFPA 327-1987, *Standard Procedures for Cleaning or Safeguarding Small Tanks and Containers.*

6-1.2 Other Publications.

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

ANSI B31-1977, *American National Standard 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*, 1983 Edition.

6-1.2.3 ASTM Publications. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D-56-82, *Standard Method of Test for Flash Point by the Tag Closed Tester*

ASTM D-93-80, *Standard Method of Test for Flash Point by the Pensky-Martens Closed Tester.*

Appendix A Referenced Publication

A-1 The following document 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.

A-1-1 NFPA Publication. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 77-1988, *Recommended Practice on Static Electricity.*

Index

SUBMITTING PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Contact NFPA Standards Administration for final date for receipt of proposals on a specific document.

INSTRUCTIONS

Please use the forms which follow for submitting proposed amendments. Use a separate form for each proposal.

1. For each document on which you are proposing amendment indicate:
   (a) The number and title of the document
   (b) The specific section or paragraph.

2. Check the box indicating whether or not this proposal recommends new text, revised text, or to delete text.

3. In the space identified as "Proposal" include the wording you propose as new or revised text, or indicate if you wish to delete text.

4. In the space titled "Statement of Problem and Substantiation for Proposal" state the problem which will be resolved by your recommendation and give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If a statement is more than 200 words in length, the technical committee is authorized to abstract it for the Technical Committee Report.

5. Check the box indicating whether or not this proposal is original material, and if it is not, indicate source.

6. If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee.

7. Type or print legibly in black ink.

NOTE: The NFPA Regulations Governing Committee Projects in Paragraph 10-10 state: Each proposal shall be submitted to the Council Secretary and shall include:

(a) identification of the submitter and his affiliation (Committee, organization, company) where appropriate, and

(b) identification of the document, paragraph of the document to which the proposal is directed, and

(c) a statement of the problem and substantiation for the proposal, and

(d) proposed text of proposal, including the wording to be added, revised (and how revised), or deleted.