

NFPA No.

32

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Flammable Liquids*

Standards for
DRY CLEANING PLANTS

May
1954



Price: Thirty-five Cents*

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NATIONAL FIRE PROTECTION ASSOCIATION
International

60 Batterymarch Street, Boston 10, Mass.

NATIONAL FIRE PROTECTION ASSOCIATION

INTERNATIONAL

Executive Office: 60 Batterymarch St., Boston 10, Mass.

The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection and prevention, to obtain and circulate information on these subjects and to secure the cooperation of its members in establishing proper safeguards against loss of life and property by fire. Its membership includes over a hundred and eighty national and regional societies and associations (list on outside back cover) and more than fifteen thousand individuals, corporations, and organizations. Anyone interested may become a member; membership information is available on request.

This pamphlet is one of a large number of publications on fire safety issued by the Association; a complete list is available without charge on request. The standards, prepared by the technical committees of the National Fire Protection Association and adopted in the annual meetings of the Association, are intended to prescribe reasonable measures for minimizing losses of life and property by fire. All interests concerned have opportunity through the National Fire Protection Association to participate in the development of the standards and to secure impartial consideration of matters affecting them.

NFPA standards are purely advisory as far as the Association is concerned, but are widely used by law enforcing authorities in addition to their general use as guides to fire-safety.

Definitions

The official NFPA definitions of "shall", "should" and "approved" are:

SHALL is intended to indicate requirements.

SHOULD is intended to indicate recommendations, or that which is advised but not required.

APPROVED refers to approval by the authority having jurisdiction.

Units of measurements used here are U. S. standard. 1 U. S. gallon=0.83 Imperial gallons=3.785 liters.

Approved Equipment

The National Fire Protection Association does not "approve" individual items of fire protection equipment, materials or services. The standards are prepared, as far as practicable, in terms of required performance, avoiding specifications of materials, devices or methods so phrased as to preclude obtaining the desired results by other means. The suitability of devices and materials for installation under these standards is indicated by the listings of nationally recognized testing laboratories, whose findings are customarily used as a guide to approval by agencies applying these standards. Underwriters' Laboratories, Inc., Underwriters' Laboratories of Canada and the Factory Mutual Laboratories test devices and materials for use in accordance with the appropriate standards, and publish lists which are available on request.

Standards for Dry Cleaning Plants.

NFPA NO. 32-1954

This standard was adopted by the NFPA in May 1954 on recommendation of the Sectional Committee on Dry Cleaning under its new title, superseding the 1944 edition of Standards for Safeguarding Dry Cleaning and Dry Dyeing Plants. The 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 and complete revised editions in 1936 and 1944.

The current revision brings the existing standard in line with present day terminology in the affected industries. In view of the many changes now taking place in the dry cleaning industry, considerable future work is anticipated in maintaining these standards in keeping with accepted and approved practice.

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Standards For Dry Cleaning Plants

(NFPA No. 32-1954)

INTRODUCTION

1. Purpose.

These standards and operating rules are intended to provide reasonable safeguards for the prevention and control of fire and explosion hazards incident to dry cleaning and dry dyeing operations, and for the protection of the employees and the public.

2. Scope.

These standards and operating rules shall apply to establishments hereinafter defined as dry cleaning plants and dry dyeing plants. Requirements for control of toxicity and health hazards are not covered by these standards.

3. Definitions:

301. "DRY CLEANING" shall mean the process of removing dirt, grease, paints and other stains from wearing apparel, textiles, fabrics, rugs, etc., by the use of non-aqueous liquid solvents, flammable or non-flammable. Methods of dry cleaning include:

- (a) Immersion and agitation with the solvent in open vessels.
- (b) Immersion and agitation with the solvent in closed machines
- (c) "Brushing" or "scouring" with cleaning solvents.

302. "SPOTTING" (prespotting) shall mean the local application of solvents to spots, dirt, grease, paints and stains for removal of the same.

303. "DRY DYEING" shall mean the process of dyeing clothes or other fabrics or textiles in a solution of dye colors and non-aqueous liquid solvents. In the standards which follow, wherever reference is made to "dry cleaning", it shall mean either dry cleaning or dry dyeing operations.

304. "DRY CLEANING PLANT" shall mean a plant in which dry cleaning is conducted.

305. "DRY CLEANING ROOM" shall mean a building or room in which the dry cleaning operations are conducted, including all additional sections containing solvent or solvent handling equipment.

306. "SOLVENT CLASSIFICATION" shall mean a method for classifying solvents according to fire hazard and in these standards the following schedule developed by Underwriters' Laboratories,

Inc., for the rating of hazards of flammable liquids shall be employed:

Ether rates	100
Gasoline rates	90-100
Alcohol (ethyl) rates	60- 70
Kerosene rates	30- 40
Paraffin oil rates	10- 20

307. "SYSTEM CLASSIFICATION" shall mean, for the purpose of these standards, that dry cleaning plants or systems are arranged in four classes according to the foregoing hazard scale as follows:

Class I —Systems utilizing solvents rated above 40. (Example—50° F. Flashpoint Naphtha.)

Class II —Systems utilizing solvents rated 40 or below, but which do not comply with Class III or Class IV requirements. (Example—Stoddard Solvent)

Class III—Systems employing equipment listed by Underwriters' Laboratories, Inc., utilizing listed solvents having specified characteristics and rated at 25 or below. (Example—140° F. Flashpoint Solvent) See Section 3001 for solvent specifications.

Class IV—Systems utilizing solvents classified as non-flammable, or as non-flammable at ordinary temperatures and only moderately flammable at higher temperatures (rated not over 5). (Examples—Carbon Tetrachloride and Perchlorethylene.)

4. General Requirements.

401. Except as provided in Sections 16, 26 and 37, dry cleaning by immersion and agitation in open vessels is prohibited.

402. Dry cleaning by immersion and agitation in closed machines shall be carried on only with machinery and equipment designed, installed, and operated in accordance with these standards.

403. Before any dry cleaning plant is established or constructed, or 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.

It is recommended that these plans be drawn to an indicated scale, showing relative location of dry cleaning building, boiler room, finishing building or departments, storage tanks

for solvents, pumps, washers, drying tumblers, extractors, filter traps, stills, condensers, piping, etc., and show sectional elevation of the buildings (including lowest floors or pits, tanks, their fittings, devices, etc.).

404. Machines shall be furnished by the manufacturers with name-plates indicating the class of solvent for which each machine is designed. Written instructions shall be given the buyer covering proper installation and safe operating methods of using equipment and solvent.

405. The use of solvents having a hazard rating greater than that for which a machine is designed is prohibited.

CHAPTER I

CLASS I. DRY CLEANING PLANTS.

1000. Dry cleaning plants or systems utilizing solvents rated above 40 as to hazard shall be designated as Class I installations. The use of solvents rated above 40 is not recommended but existing Class I plants may be permitted to operate at the discretion of the authority having jurisdiction and shall comply with the following provisions.

11. Location.

1101. It is recommended that Class I dry cleaning plants be located in outlying sparsely built sections. Buildings used for dry cleaning shall not be used for any other purpose. The dry cleaning buildings shall be not closer than ten feet to the line of adjoining property, except when the exposing wall of the dry and without openings. A dry cleaning building may be located on the property line but in no case shall more than two sides have blank walls.

12. Construction.

1201. Building shall not be over one-story in height, without attics, concealed roof spaces, basements or pits.

1202. Walls shall be of brick, not less than 12 inches thick or equivalent construction. Wall finish shall be either plain or plastered without furring. Division walls between dry cleaning and other buildings shall be blank. Two exits shall be provided remote from each other and leading directly to the outside of the building.

1203. Floors shall not be below grade and shall be of non-combustible construction at the ground level and shall have no pits, wells or pockets. The wearing surface shall be of non-combustible material.

1204. The roof shall be flat and of fire-resistive construction. Skylights constructed of metal frame and sash shall be provided.

1205. Adequate explosion venting shall be provided as follows: windows necessary for venting capacity shall be hung so that they will swing out readily in case of an explosion, preferably in the direction that will cause least damage to personnel or property. These windows shall not be secured while the plant is in operation. The sash of vertically mounted skylights shall be of the bottom-hinged type, with pivots located above the snow and ice line, so hung as to swing out readily in case of an explosion; or in lieu thereof, horizontal skylights may be constructed of metal frame and sash and be provided with scored thin glass. In such installations a wire screen shall be provided above and below the skylights.*

13. Ventilation, Air Conditioning, Lighting, Heating, Power.

1301. A mechanical system of ventilation shall be installed in accordance with the Standards for Blower and Exhaust Systems** (NFPA No. 91) and shall be provided with means for remote control. Mechanical systems of ventilation shall have sufficient capacity to insure complete and continuous change of air in dry cleaning rooms once every three minutes. The ventilation system shall be automatically shut off upon operation of the fire protection or detection system where required by the authority having jurisdiction. The ventilating system shall operate automatically at all times when any dry cleaning equipment is in use.

1302. The spiders and blades or running rings of exhaust fans shall be of nonferrous metal. Motors for fans shall not be installed in ducts.

1303. With respect to electrical installations, Class I dry cleaning plants shall be considered to be Class I, Division 1, hazardous locations, under Article 500 of the National Electrical Code.** All wiring shall be in rigid conduit installed in accordance with the requirements for Class I, Division 1, hazardous locations. Electrical motors, motor controllers, overcurrent devices, switches and other electrical devices, if installed or operated in dry cleaning rooms, shall be approved for Class I, Group D, hazardous locations. Lighting shall be by electricity. Lighting fixtures, switches, communication and signalling equipment, and other fixed and portable electrical devices shall be approved for Class I, Group D, hazardous locations, as defined by the National Electrical Code.**

*See Guide for Explosion Venting (NFPA No. 68).

**Available from NFPA Publications Service Dept. (NFPA No. 70).

1304. Heating shall be by steam or hot water only. Steam pipes and radiators for heating purposes shall be spaced at least one inch from all woodwork and shall be protected by substantial metal screens arranged to prevent combustible goods or materials from coming in contact with such pipes and radiators. The tops of such enclosures shall be arranged to prevent their use as shelves.

1305. Dry cleaning rooms shall have provisions for humidifying or conditioning the air during the cold seasons and at all times in dry climates. The installation shall be subject to the approval of the authority having jurisdiction.

1306. The humidifier may have a manual or automatic control. The relative humidity shall be maintained at not less than 60 per cent.

1307. With a manually controlled humidifier a reliable form of recording hygrometer shall be installed in each room to indicate the relative humidity of the air.

1308. Boilers shall be located, when possible, in a detached building. When in a building, or room, adjoining dry cleaning rooms, the boiler building, or room, shall be cut off therefrom by a standard fire wall without openings. Openings into boiler rooms shall be at least 10 ft. from any exterior openings into the cleaning room.

14. Tanks, Purifiers, Clarifiers and Filters.

1401. All solvent storage tanks shall be underground and installed and equipped in accordance with the Suggested Ordinance on Flammable Liquids* (NFPA No. 30-L).

1410. Aboveground treatment tanks or purifiers shall be safeguarded as follows:

1411. Such containers shall not have an individual capacity in excess of 350 gallons.

1412. Containers shall be securely mounted on rigid non-combustible supports.

1413. Containers shall be provided with 1¼-inch vent pipes extending to the outside of the building. Such vents shall be protected by approved flame arresters.

1414. Containers shall be permanently and effectively grounded to dissipate static electricity.

1415. It is recommended that each aboveground container be provided with an automatic heat actuated emergency drain connection of ample capacity to discharge the contents to the underground storage tanks within a period of five minutes. It is

*Available from the NFPA Publications Service Dept.

recommended that this connection be arranged to minimize the possibility of plugging from lint, sludge, etc.

1420. Centrifugal clarifiers shall be installed and operated as follows:

1421. All overhead tanks used for supply purposes to clarifiers operating on the batch clarification system shall be limited to 350 gallons capacity; they shall be provided with automatic heat actuated emergency drain connections to underground tanks; such connections shall be of sufficient capacity to empty the overhead tank in five minutes.

1422. Clarifiers installed on the continuous system of clarification shall be located as close as possible to the washing machines with which they are connected.

1423. In no case shall clarifiers be run at a speed in excess of that prescribed by the manufacturer. This speed shall be given in revolutions per minute and shall be marked on the name-plate of the machine. Steam driven clarifiers shall be equipped with approved governors.

1424. All liquid level gauge glasses, unless of approved heavy duty type, shall be equipped with an automatic device which will immediately shut off the flow of solvent if the glass is broken. These liquid level gauge glasses shall be guarded against physical damage.

1425. Pumps used in conjunction with clarifiers on the continuous system of clarification shall be properly designed and substantially constructed, and when of the positive displacement type, shall be fitted with a relief valve and by-pass set so as to prevent excessive pressure.

1426. There shall be provided at suitable points in the pipe lines of all continuous systems, a quick acting valve for completely emptying all pipes and traps in the system to the underground tanks.

1427. All clarifiers shall be periodically inspected and repairs made if necessary.

1430. Filters shall be installed and operated as follows:

1431. Pressure type filters shall be equipped with a reliable pressure gauge, and shall not be operated at pressures exceeding that recommended by the manufacturers.

1432. Pressure filters shall be provided with an air vent line connected to discharge into the washer or into the storage tank supply line. Such vents shall not discharge into the room.

15. Pumps, Pipe Manifold for Handling Solvents, Washers, Drying Tumblers, Extractors, Separators and Stills.

1500. All apparatus of this class shall be in accordance with the following general requirements:

1501. Apparatus shall be approved by the authority having jurisdiction.

1502. Apparatus shall be installed and connected in accordance with the "Suggested Ordinance for the Storage, Handling and Use of Flammable Liquids"* (NFPA No. 30-L).

1503. All liquid-handling parts such as washers, extractors, filters, button traps, and moisture separators shall be constructed to prevent leakage of solvent.

1504. When pulleys and belting are used in the dry cleaning room the danger from static electricity shall be mitigated by the installation of properly grounded combs, or collectors, or by other methods approved by the authority having jurisdiction.

1510. Pumps and Piping.

1511. The handling of solvents from the storage tank, through the various machines and back to the settling and clear solvent tanks shall be through closed circuits of piping.

1512. Sight glasses, 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.

1513. Pumps shall be provided with a separate suction and discharge connection for removal of sludge from the underground treating and settling tanks. The suction pipe shall be carried to the tank bottom and the discharge connection to a suitable container; in no case shall the discharge be into a sewer.

1514. All pumps handling solvent shall be designed for use with hazardous liquids. Pumps of the positive displacement type shall be fitted with a relief valve and by-pass set so as to prevent excessive pressure.

1515. All piping shall be tested to a minimum pressure of at least 50 per cent in excess of its normal operating pressure and proved tight and protected against physical damage.

1516. Piping, valves, and fittings for solvents shall be designed for the working pressures and structural stresses to which they may be subjected. They shall be of steel or other material

*Available from the NFPA Publications Service Dept.

suitable for use with the solvent. Pipe systems shall be substantially supported and protected against physical damage and excessive stresses arising from settlement, vibration, expansion or contraction. Pipe systems shall contain a sufficient number of valves to operate the system properly and to protect the plant.

1520. Washing machines, in addition to complying with the preceding general requirements (Section 1500) shall be in accordance with the following:

1521. Washing machines shall be of substantial construction and provided with splash-proof doors of the outside case hinge type and shall be provided with interlocks to prevent cylinder rotation under power except for inching when doors are open.

1522. Washing machines shall be securely attached to the floor.

1523. The cylinders and shells of all washing machines shall be permanently and effectively grounded to dissipate static electricity. The grounding of the cylinder in each case shall be through the trunnion shaft and in cases where wooden cylinders are used, shall be grounded also across the inner surface of the cylinder.

1524. Each washing machine shall be provided with an overflow pipe one size larger than the size of the solvent supply line to the machine. Such overflow pipe shall be connected to the shell of the washer so that the top of the overflow is below the bottom of the trunnion shaft, shall be without shut-off valves, and shall be arranged to discharge to an underground tank.

1525. Individual button and lint traps shall be provided for each washer.

1526. The supply pipes to washing machines whether from pumps, filters, clarifiers or storage tanks shall enter the washing machine from above the charged liquid level.

1527. Each washing machine shall be provided with approved extinguishing equipment, arranged to operate automatically in case of fire, consisting of a carbon dioxide system in accordance with the Standards for Carbon Dioxide Extinguishing Systems* (NFPA No. 12) or a steam jet not less than $\frac{3}{4}$ inch with a continuously available steam supply at a pressure of not less than 15 pounds per square inch.

1530. Stills and condensers, in addition to complying with the preceding general requirements (Section 1500) shall be in accordance with the following:

*Available from the NFPA Publications Service Dept.

1531. Steam or hot water only 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.

1532. Stills and condensers shall be liquid and gas-tight.

1533. Stills shall be designed for operation on the vacuum principle.

1534. If a relief valve is provided it shall be equipped with a vent line extending to the outside.

1535. A check valve shall be installed in the steam line between the boiler and the still.

1536. Each still shall be provided with a combination vacuum and pressure gauge.

1537. Each still shall be equipped with a constant level valve to automatically maintain the solvent liquid level in the still at the proper height.

1538. Each still shall be provided with an automatic heat actuated emergency drain connection of ample capacity to discharge entire contents to underground storage tanks within a period of five minutes.

1540. Drying tumblers and drying cabinets, in addition to complying with the preceding general requirements (Section 1500) shall be in accordance with the following:

1541. Drying tumblers shall be of substantial tight construction, well secured to substantial foundations, and shall be provided with self-closing explosion hatches having an area equal to at least (1) square foot for each 30 cubic feet of cylinder volume. Hatches shall be arranged to open away from the operator.

1542. The cylinder and shell of all drying tumblers shall be permanently and effectively grounded to dissipate static electricity. The grounding of the cylinder in each case shall be through the end of the shaft.

1543. Drying tumblers shall be provided with a steam jet, of not less than $\frac{3}{8}$ inch size, for humidifying during the drying process.

1544. Drying tumblers and drying cabinets shall be ventilated to the outside air by means of properly constructed metal 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 six feet above the roof and shall be provided with cleanout facilities.

1545. Discharge pipes shall not terminate within ten feet measured horizontally from any door, window or frame wall of any adjoining or adjacent building.

1546. The fan shall be properly housed and so interlocked as to insure operation while the drying tumbler is in use. The fan spiders, blades or running rings shall be constructed of non-ferrous metal. In no case shall the fan motor be located within the ventilating duct.

1547. Each drying tumbler shall be provided with approved extinguishing equipment, arranged to operate automatically in case of fire, consisting of a carbon dioxide or steam jet as specified in paragraph 1527.

1550. Extractors, in addition to complying with the preceding general requirements (Section 1500), shall be in accordance with the following:

1551. Extractors shall be of substantial construction and securely attached to rigid noncombustible supports.

1552. The baskets shall have a rim of non-ferrous metal and shall be well balanced.

1553. Extractors shall be provided preferably with non-ferrous metal liquid tight covers, or they shall be designed so that none of the liquid solvent is thrown out of the extractor while it is in operation. The cover shall be equipped with automatic mechanical or electrical interlocks which will prohibit operating the extractors while the cover is open and which will prohibit opening the cover until the basket comes to rest.

1554. Extractors shall be provided with a drain pipe not less than 1½ inches in diameter connected direct to underground storage tanks or to the washer through an approved extractor pump with connections fitted with proper valves.

1555. The outside shell of extractors shall be permanently and effectively grounded for dissipation of static electricity.

1556. Brakes, if used, shall be so designed as to prevent the creation of sparks or excessive heat.

1557. Extractors shall not be operated at a speed in excess of that prescribed by the manufacturer as shown on the nameplate which must be provided on each machine.

16. Scouring or Brushing and Spotting.

1601. All scouring or brushing operations shall be carried on in the dry cleaning room or in a separate room complying with all provisions for Class I dry cleaning plants.

1602. The brushing (prespotting) table shall have a liquid tight top with a curb on all sides not less than 1 inch high. The top of the table shall be pitched so as to insure thorough draining to a 1½ inch drain connected to a suitable container especially provided and marked for that purpose.

1603. The scouring or brushing table or scrubbing tub shall be so located as to ensure thorough and effective disposal of vapors through the ventilating system.

1604. Articles, the character of which prevents their washing in the usual washing machines, may be cleaned on scouring or brushing tables or in approved scrubbing tubs provided the total amount of solvent used in such open containers shall not exceed 3 gallons. Scrubbing tubs shall be secured to the floor and shall be provided with permanent 1½ inch trapped drains to a suitable container specially provided and marked for that purpose.

17. Operating Requirements.

1701. All employees shall be thoroughly instructed as to the hazards involved in their departments and in the work which they perform.

1702. Clothing shall be thoroughly searched in the receiving room and all foreign materials, especially matches and metallic substances, removed.

1703. In removing clothes from the washer, provisions shall be made for minimizing the dripping of solvent on the floor. When clothes are transferred from a washer to a drain tub a non-ferrous metal drip apron shall be placed so as to rest on the drain tub and the cylinder of the washer.

1704. 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 kept securely in place.

1705. No drying operation before washing shall be permitted unless articles so dried are properly humidified before removal to washing machines.

1706. Flammable liquids shall not be used for cleaning floors.

1707. Smoking on the premises shall be strictly prohibited except at designated smoking areas. "No smoking" signs shall be posted.

1708. On the discovery of fire the ventilating system shall be shut down immediately.

1709. In order that reliable operation of the steam or other extinguishing system may be assured, periodic inspections of all valves and piping shall be made. Steam lines shall also be subjected to test.

18. Fire Protection.

1801. An asbestos blanket not less than 7 x 7 feet and a boat hook with a handle at least six feet long, shall be provided for each dry cleaning room, kept on a convenient rack at the principal entrance. Where the size or arrangement of the room is such as to require a travel of more than 50 feet from any point in the room to reach the principal entrance, additional asbestos blankets and boat hooks shall be provided as directed by the authority having jurisdiction.

1802. Suitable first aid fire protection shall be provided in accordance with Standards for First Aid Fire Appliances (NFPA No. 10).^{*} The provision of automatic fire extinguishing systems is recommended.

1803. Approved first aid extinguisher devices of a type suitable for use on flammable liquid fires shall be provided for every room or area where flammable liquids are used. In no case shall there be less than one extinguisher of B-1 rating at each entrance of every room or area where flammable liquids are used.

CHAPTER II

CLASS II. DRY CLEANING PLANTS.

2000. Dry cleaning plants or systems utilizing solvents rated 40 or below but which do not comply with Class III or Class IV requirements shall be designated as Class II installations, and shall comply with the following requirements.

2001. Systems employing solvents rated 25 or below, but not provided with approved equipment as required under Class III, or where such solvents are not listed specifically for use with such systems, shall automatically fall in Class II.

21. Location.

2101. The requirements of Section 21 are based upon the location being in unsprinklered buildings; at the discretion of the authority having jurisdiction they may be modified if the building

^{*}Available from the NFPA Publications Service Dept.

is protected throughout by means of an approved automatic sprinkler system.

2102. It is recommended that Class II dry cleaning plants be located in outlying sparsely built sections. The dry cleaning buildings shall be not closer than ten feet to the line of adjoining property except that when the exposing wall of the dry cleaning building is of 12 inch brick or equivalent construction, and without openings, it may be located on the property line.

2103. Dry cleaning operations shall in no event be carried on in the same building with other occupancies. Operations incidental to or in connection with the dry cleaning business, such as laundering, scouring, scrubbing, drying, pressing, ironing, etc., shall not be classed as "other occupancies", for the purpose of this standard.

22. Construction.

2201. The location of Class II dry cleaning systems shall be restricted to the lowest floor of a building but shall not be located on any floor below grade.

2202. Walls shall be of masonry or noncombustible construction and wall finish shall be plain or plastered without furring or concealed spaces.

2203. Floors of dry cleaning sections shall be of fire-resistive construction and shall have no pits, walls or pockets. The wearing surface shall be of a noncombustible material and where located over a basement, floor shall be vapor and liquid tight.

2204. Roof and floors above grade floor should preferably be of fire-resistive or noncombustible construction, but if of combustible construction, the ceilings over the dry cleaning areas shall be protected by cement or gypsum plaster on metal lath or equivalent construction having not less than a one hour fire resistance classification.

2205. Door openings on stairs or elevators leading from a dry cleaning area to a basement, or opening into room having openings or stairs to basements, shall be provided with noncombustible sills or ramps raised at least 6 inches. Approved self-closing Class B fire doors shall be provided at such openings. Enclosures shall be of construction equivalent to the floor construction but having a fire-resistive rating of not less than 1 hour.

2206. Where incidental operations, such as those permitted under paragraph 2103 are located on the same floor with dry cleaning plants, the dry cleaning operations shall be cut off therefrom by fire partitions capable of providing two hours fire resistance, and

should preferably be located in a corner of the building so that the exterior walls will form a part of the enclosure required by this standard. Any openings in partitions shall be protected with an approved automatic Class B fire door.

NOTE: The requirements of paragraph 2206 may be waived at the discretion of the authority having jurisdiction based upon a consideration of such factors as type of building construction involved, nature of operations, and extent of private protection provided.

2207. Drying should preferably be conducted in suitably protected drying cabinets or tumblers, but where done in dry rooms, such rooms shall be constructed with walls, partitions and ceilings of material capable of furnishing two hours fire resistance, and having self-closing doors of equivalent construction. If the drying room is in a separate building, the building shall conform in all respects to the requirements for the dry cleaning building.

23. Ventilation, Lighting, Heating and Power.

2301. A mechanical system of ventilation shall be installed in dry cleaning areas in accordance with the Standards for Blower and Exhaust Systems* (NFPA No. 91) and shall be provided with means for remote control. Mechanical systems of ventilation shall have sufficient capacity to insure complete and continuous change of air in dry cleaning rooms once every six minutes. The ventilation system shall operate automatically when any dry cleaning equipment is in use. The ventilation system shall be automatically shut off upon operation of the fire protection or detection system where required by the authority having jurisdiction.

2302. The spiders and blades or running rings of exhaust fans shall be of non-ferrous metal, and motors for fans shall not be installed in ducts.

2303. With respect to electrical installations, Class II dry cleaning plants shall be considered to be Class I, Division 1, hazardous locations, under Article 500 of the National Electrical Code,* with the exception that lighting fixtures, switches, communication and signalling equipment, and other fixed and portable devices, located 8 feet or more above the floor, may be installed in accordance with the requirements for Class I, Division 2, hazardous locations. All wiring shall be in rigid conduit installed in accordance with the requirements for Class I, Division 1, hazardous locations. Electrical motors, motor controllers, over-current devices, switches and other electrical devices, if installed or used in dry cleaning rooms, shall be approved for Class I,

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Group D, hazardous locations. Lighting shall be by electricity. Lighting fixtures, switches, communication and signalling equipment, and other fixed and portable devices, located within 8 feet of the floor, shall be approved for Class I, Group D, hazardous locations as defined by the National Electrical Code.*

2304. Heating shall be by steam or hot water only. Steam and hot water pipes and radiators for heating purposes shall be at least one inch from all woodwork and shall be protected by substantial metal screens arranged to prevent combustible goods or materials from coming in contact with such pipes and radiators. The tops of such enclosures shall be arranged to prevent their use as shelves.

2305. Boilers shall be located, when possible in a detached building. When in a building, or room, adjoining dry cleaning rooms, the boiler building, or room shall be cutoff therefrom by a standard fire wall without openings. Openings into boiler rooms shall be at least 10 feet from any exterior openings into the cleaning room.

24. Tanks, Purifiers, Clarifiers and Filters.

2401. All solvent storage tanks shall be underground or in approved enclosures installed and equipped in accordance with the National Fire Protection Association's Suggested Ordinance for the Storage, Handling and use of Flammable Liquids (NFPA No. 30-L), except that inside (aboveground) storage tanks may be used provided the aggregate capacity of the storage tanks does not exceed 550 gallons and the individual capacity of any storage tank does not exceed 275 gallons. All aboveground storage tanks shall be provided with 1¼ inch vent pipes extending to the outside of the building.

2410. Aboveground treatment tanks or purifiers shall be safeguarded as follows:

2411. Such containers shall have an individual capacity not in excess of 350 gallons, and shall in no event exceed in capacity any individual storage tank to which they may be connected.

2412. Containers shall be securely mounted on rigid noncombustible supports.

2413. Containers shall be provided with 1¼ inch vent pipes extending to the outside of the building.

2414. Containers shall be permanently and effectively grounded to dissipate static electricity.

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2415. It is recommended that each aboveground container be provided with an automatic heat actuated emergency drain connection of ample capacity to discharge the contents to the underground storage tanks within a period of five minutes. It is recommended that this connection be arranged to minimize the possibility of plugging from lint, sludge, etc.

2420. Filters shall be installed and operated as follows:

2421. Pressure type filters shall be equipped with a reliable pressure gauge and shall not be operated at pressures exceeding that recommended by the manufacturers.

2422. Pressure filters shall be provided with an air bleeding valve and line connected to discharge into the washer or into the storage tank supply line. Such vents shall not discharge into the room.

2423. All liquid level gauge glasses, unless of approved heavy duty type, shall be equipped with an automatic device which will immediately shut off the flow of solvent if the glass is broken. These liquid level gauge glasses shall be guarded against physical damage.

25. Pumps, Piping, Washers, Drying Tumblers, Extractors, Separators and Stills.

2500. All apparatus of this class shall be in accordance with the following general requirements:

2501. Apparatus shall be approved by the authority having jurisdiction.

2502. Apparatus shall be installed and connected in accordance with the National Fire Protection Association's Suggested Ordinance for the Storage, Handling and Use of Flammable Liquids* (NFPA No. 30-L).

2503. All liquid-handling parts such as washers, extractors, filters, button traps, and moisture separators shall be constructed to prevent leakage of solvent.

2504. When pulleys and belting are used in the dry cleaning room the danger from static electricity shall be mitigated by the installation of properly grounded combs or collectors, or by other method approved by the authority having jurisdiction.

2510. Pumps and Piping.

2511. The handling of solvents from the storage tank through the various machines and back to the settling and clear solvent tanks, shall be through closed circuits of piping.

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2512. Sight glasses, 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.

2513. Sludge pumps shall be provided to remove sludge from underground treating and settling 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.

2514. All pumps handling solvent shall be designed for use with hazardous liquids. Pumps of the positive displacement type shall be fitted with a relief valve and by-pass set so as to prevent excessive pressure.

2515. All piping shall be tested to a minimum pressure of at least 50 per cent in excess of its normal operating pressure and proved tight and protected against physical damage.

2516. Piping, valves, and fittings for solvents shall be designed for the working pressures and structural stresses to which they may be subjected. They shall be of steel or other material suitable for use with the solvent. Pipe systems shall be substantially supported and protected against physical damage and excessive stresses arising from settlement, vibration, expansion or contraction. Pipe systems shall contain a sufficient number of valves to operate the system properly and to protect the plant.

2520. Washing machines, in addition to complying with the preceding general requirements (Section 2500) shall be in accordance with the following:

2521. Washing machines shall be of substantial construction and provided with splash-proof doors of the outside case hinge type and shall be provided with interlocks to prevent cylinder rotation under power except for inching when doors are open.

2522. Each washing machine shall be provided with an overflow pipe one size larger than the size of the solvent supply line to the machine. Such overflow pipe shall be connected to the shell of the washer so that the top of the overflow is below the bottom of trunnion shaft, shall be without shut-off valves, and shall be arranged to discharge to an underground tank.

2523. Washing machines shall be securely attached to the floor.

2524. The cylinders and shells of all washing machines shall be permanently and effectively grounded to dissipate static electricity. The grounding of the cylinder in each case shall be through the trunnion shaft and in cases where wooden cylinders

are used, shall be grounded also across the inner surface of the cylinder.

2525. Individual button and lint traps shall be provided for each washer.

2526. The supply pipes to washing machines whether from pumps, filters or storage tanks, shall enter the washing machines above the charged liquid level.

2527. Each washing machine shall be provided with approved extinguishing equipment, arranged to operate automatically in case of fire consisting of a carbon dioxide system in accordance with the Standards for Carbon Dioxide Fire Extinguishing Systems* (NFPA No. 12) or a steam jet not less than $\frac{3}{4}$ inch with a continuously available steam supply at a pressure of not less than 15 pounds per square inch.

2530. Stills and condensers, in addition to complying with the preceding general requirements (Section 2500) shall be in accordance with the following:

2531. Steam or hot water only 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.

2532. Stills and condensers shall be liquid and gas-tight.

2533. Stills shall be designed for operation on the vacuum principle.

2534. If a relief valve is provided it shall be equipped with a vent line extending to the outside.

2535. A check valve shall be installed in the steam line between the boiler and the still.

2536. Each still shall be provided with a combination vacuum and pressure gauge.

2537. Each still shall be equipped with a constant level valve to automatically maintain the solvent liquid level in the still at the proper height.

2540. Drying tumblers and drying cabinets, in addition to complying with the preceding general requirements (Section 2500) shall be in accordance with the following:

2541. Drying tumblers shall be of substantial tight construction, well secured to substantial foundations, and shall be provided with self-closing explosion hatches having an area equal to

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at least (1) square foot for each 30 cubic feet of cylinder volume. Hatches shall be arranged to open away from the operator.

2542. The cylinders and shells of all drying tumblers shall be permanently and effectively grounded to dissipate static electricity. The grounding of the cylinder in each case shall be through the trunnion shaft.

2543. Drying tumblers shall be provided with a steam jet, of not less than $\frac{3}{8}$ inch pipe size, for humidifying during the drying process.

2544. Drying tumblers and drying cabinets 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 six feet above the roof, and shall be provided with cleanout facilities.

2545. Discharge pipes shall not terminate within ten feet measured horizontally from any door, window or frame walls of any adjoining or adjacent building.

2546. The fan shall be properly housed and so interlocked as to insure operation while the drying tumbler is in use. The fan spiders, blades or running rings shall be constructed of non-ferrous metal. In no case shall the fan motor be mounted within the ventilating duct.

2547. Each drying tumbler shall be provided with approved extinguishing equipment, arranged to operate automatically in case of fire, consisting of a carbon dioxide or steam jet system as specified in paragraph 2527.

2550. Extractors, in addition to complying with the preceding general requirements (Section 2500) shall be in accordance with the following:

2551. Extractors shall be of substantial construction and securely attached to rigid noncombustible supports.

2552. The baskets shall have a rim of non-ferrous metal and shall be well balanced.

2553. Extractors shall be provided preferably with non-ferrous metal liquid-tight covers, or they shall be designed so that none of the liquid solvent is thrown out of the extractor while it is in operation. The cover shall be equipped with automatic mechanical or electrical interlocks which will prohibit operating the extractors while the cover is open and which will prohibit opening the cover until the basket comes to rest.

2554. Extractors shall be provided with a drain pipe not less than $1\frac{1}{2}$ inches in diameter connected direct to underground storage tanks or to a suitable aboveground container, or to the washer through an approved extractor pump with connections fitted with proper valves.

2555. The outside shell of extractors shall be permanently and effectively grounded for dissipation of static electricity.

2556. Brakes, if used, shall be so designed as to prevent the creation of sparks or excessive heat.

2557. Extractors shall not be operated at a speed in excess of that prescribed by the manufacturer as shown on the nameplate which must be provided on each machine.

26. Scouring or Brushing and Spotting.

2601. All scouring or brushing and spotting (prespotting) operations should preferably be conducted with liquids or solvents having a fire hazard rating of 40 or less, except that solvents having a higher hazard rating may be used in quantities not exceeding a total of one gallon when dispensed from approved safety cans. Additional storage shall be in approved safety cans of not over one gallon capacity.

2602. When scouring or brushing operations utilize solvents rating above 40 in excess of one gallon, such operations shall be conducted in separate buildings complying in all respects with the requirements for Class I dry cleaning plants and including the detailed requirements for scouring, brushing and scrubbing as specified in paragraphs 1602 and 1603 for Class I systems.

2603. No washing or scrubbing with solvents rated above 40 shall be carried on in any Class II plant.

2604. The brushing (prespotting) table shall have a liquid-tight top with a curb on all sides not less than 1 inch high. The top of the table shall be pitched so as to insure thorough draining to a $1\frac{1}{2}$ -inch drain connected to a suitable container especially provided and marked for that purpose.

2605. The scouring or brushing table or scrubbing tub shall be so located as to ensure thorough and effective disposal of vapors through the ventilating system.

2606. Articles, the character of which prevents their washing in the usual washing machines, may be cleaned on scouring or brushing tables or in approved scrubbing tubs provided the total amount of solvent used in such open containers shall not exceed 3 gallons. Scrubbing tubs shall be secured to the floor and shall be provided with permanent $1\frac{1}{2}$ inch trapped drains to a suitable container especially provided and marked for that purpose.

27. Operating Requirements.

2701. All employees shall be thoroughly instructed as to the hazards involved in their departments and in the work which they perform.

2702. Clothing shall be thoroughly searched in the receiving room and all foreign materials, especially matches and metallic substances, removed.

2703. In removing clothes from the washer, provisions shall be made for minimizing the dripping of solvent on the floor. When clothes are transferred from a washer to a drain tub, a non-ferrous metal drip apron shall be placed so as to rest on the drain tub and the cylinder of the washer.

2704. 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 kept securely in place.

2705. Flammable liquids shall not be used for cleaning floors.

2706. Smoking shall be strictly prohibited except at designated smoking areas. "No Smoking" signs shall be posted.

2707. On the discovery of fire, the ventilating system shall be shut down immediately.

2708. In order that reliable operation of the steam or other extinguishing system may be assured, periodic inspections of all valves and piping shall be made. Steam lines shall also be subjected to test.

28. Fire Protection.

2801. Suitable first aid fire protection shall be provided in accordance with the Standards for First Aid Fire Appliances* (NFPA No. 10). The provision of automatic fire extinguishing systems is recommended.

2802. Approved first aid extinguishing devices of a type suitable for use on flammable liquid fires shall be provided for every room or area where flammable liquids are used. In no case shall there be less than one extinguisher of B-1 rating at each entrance of every room or area where flammable liquids are used.

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CHAPTER III

CLASS III. DRY CLEANING PLANTS.

3000. Dry cleaning plants or systems employing equipment listed by Underwriters' Laboratories, Inc., utilizing listed solvents (rated at 25 or below with respect to fire hazard and complying with the specifications in paragraph 3001) shall be designated as Class III installations and shall comply with the following requirements.

3001. Solvent specifications.

Flashpoint (closed cup) Not lower than
59° C. (138.2° F.)

Initial boiling point Not lower than
181° C. (357.8° F.)

Ignition temperature Not lower than
234° C. (453.2° F.)

Lower limit of explosive range — Not less than 0.8 per cent by volume in air at an initial temperature of 150° C. (302° F.).

Spontaneous heating — The cleaning solvent shall not heat spontaneously.

3002. Dry cleaning systems of this class are suitable for use only with listed cleaning liquids specified above. The safety of operation may be endangered if cleaning liquids other than those specified are used or if equipment not tested and listed for use with the specified liquids is employed.

3003. Systems employing solvents rated at 25 or below, but not provided with approved equipment as required under Class III, or where such solvents are not listed specifically for use with such systems, shall automatically fall in Class II.

31. Location.

3100. The provisions of this section are based on locations in buildings with other occupancies.

32. Construction.

3201. Where dry cleaning plants of this class are located in the same building with other occupancies, such plants shall be cut off therefrom vertically and horizontally by construction providing one hour fire resistance. Where these conditions exist, the dry cleaning plant or department should preferably be located in a corner of the building so as to permit the use of the exterior

walls as a part of the enclosing walls required by this standard. All vertical or horizontal openings to other occupancies shall be protected by automatic fire doors approved for the type of opening. For the purpose of this standard, operations incidental to or in connection with the dry cleaning business, such as laundering, scouring, scrubbing, drying, pressing, ironing, etc., shall not be classed as "other occupancies".

3202. The requirements of paragraph 3201 may be waived at the discretion of the authority having jurisdiction based upon a consideration of such factors as type of building construction, nature of occupancy, storage and operating capacity of the system and extent of private fire protection provided.

33. Heat, Light and Power.

3301. Lighting shall be by electricity. All electrical equipment devices, and wiring for light and power shall be installed in accordance with the requirements of the National Electrical Code for Ordinary Locations* (NFPA No. 70).

3302. Boilers shall be located, when possible, in a detached building. When in the same building, and in a room adjoining the dry cleaning room, the boiler room shall be cut off by fire partitions without openings, having a fire resistance rating of not less than two hours.

3303. Heating shall be by any approved means which does not involve any open flame or ignition source in the dry cleaning area. Piping and radiators for heating purposes shall be at least one inch from all woodwork and shall be protected by substantial metal screens arranged to prevent combustible goods or materials from coming in contact with such pipes and radiators. The tops of such enclosures shall be arranged to prevent their use as shelves.

34. Tanks and Filters.

3401. The total capacity of aboveground inside solvent storage tanks shall not exceed 550 gallons, provided the individual capacity of any one such tank shall not exceed 275 gallons. Where storage capacity in excess of this quantity is desired, that in excess of 550 gallons shall be in approved containers installed underground, or in enclosures or casings constructed in accordance with Section 212 of the Suggested Ordinance for the Storage, Handling and Use of Flammable Liquids* (NFPA No. 30-L).

3402. Inside aboveground processing equipment units containing solvent shall have an individual capacity not in excess of 275 gallons. The total operating solvent capacity of the plant, in-

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cluding inside aboveground storage tanks, shall not exceed 1100 gallons.

3403. Each aboveground storage tank, extractor drain tank, and still shall be provided with a liquid level gauge, preferably of the approved magnetically operated float type. If it is impractical to use a float type gauge, sight glasses may be used, but they shall be of a type not readily damaged by heat and shall be reliably protected from breakage and physical damage.

3404. Tanks shall be located as close as possible to the washing machine with which they are connected.

3405. Solvent storage tanks, and extractor drain tanks shall be provided with not less than 1¼-inch vent pipe extending to the outside of the building.

3410. Filters shall be installed and operated as follows:

3411. Pressure type filters shall be equipped with a reliable pressure gauge and shall not be operated at pressures exceeding that recommended by the manufacturers.

3412. Pressure filters shall be provided with an air vent line connected to discharge into the washer or into the storage tank supply line. Such vents shall not discharge into the room.

35. Pumps and Piping.

3501. The handling of solvents from the storage tank, through the various machines, and back to the settling and clear solvent tanks, shall be through closed circuits of piping.

3502. Sight glasses shall be of a type not readily damaged by heat and shall be reliably protected from breakage and physical damage.

3503. All pumps handling solvent shall be approved for use with hazardous liquids. Pumps of the positive displacement type shall be fitted with a relief valve and by-pass set so as to prevent excessive pressure.

3504. When underground treating and settling tanks are used, a separate suction and discharge connection shall be provided to the pump. The suction pipe shall be carried to the tank bottom and the discharge connection to a suitable container. In no case shall the discharge be into a sewer.

3505. Piping, valves, and fittings for solvents shall be designed for the working pressures and structural stresses to which they may be subjected. They shall be of steel or other material suitable for use with the solvent. Pipe systems shall be substantially supported and protected against physical damage and excessive stresses arising from settlement vibration, expansion or