NFPA No.

32

File: 30 Series
Flammable Liquids

Standard for

DRY CLEANING PLANTS

May

1961

Sixty Cents*

3M-6-61 R&S

*See inside front cover for quantity discounts.

Printed in U.S.A.

National Fire Protection Association

International

The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection. Its membership includes national and regional societies and associations (list on outside back cover) and over eighteen thousand individuals, corporations, and organizations. Anyone interested may become a member; the annual dues are $15.00. Full membership information is available on request.

This is one of a large number of publications on fire safety issued by the Association. All NFPA standards and recommended practices, including this text, are prepared by the technical committees of the NFPA and adopted at an Annual Meeting of the Association. They are intended to prescribe reasonable measures for minimizing losses of life and property by fire.

This text and most other NFPA standards and recommended practices are published in the **National Fire Codes,** a compilation of NFPA's official technical material, issued in seven clothbound volumes. Full information on the availability of these Codes and other NFPA publications can be secured from the Association.

Official NFPA Definitions

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. One foot = 0.3048 meters. One inch = 25.40 millimeters. One pound per square inch = 0.06805 atmospheres = 2.307 feet of water.

Approved Equipment

The National Fire Protection Association does not "approve" individual items of fire protection equipment, materials or services. The suitability of devices and materials for installation under NFPA standards is indicated by the listing 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, the Factory Mutual Laboratories and the American Gas Association (gas equipment) test devices and materials for use in accordance with the appropriate standards, and publish lists which are available on request.

Discount Prices on this Pamphlet

The following schedule of discount prices for multiple copies of this pamphlet have been established:

6–11 copies: 10%	24– 47: 20%
12–23 copies: 15%	48–100: 25%

Over 100: Special Quotation

Dry Cleaning Plants.

NFPA NO. 32—1961

This standard which supersedes the edition of 1956 was adopted by the NFPA on May 17, 1961 on recommendation of the Sectional Committee on Dry Cleaning as approved by the Flammable Liquids Committee. 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, 1944, 1954 and 1956.

Changes from Last Edition

The principal change proposed for this edition is to include the permission for self-service (coin operated) dry cleaning equipment. Such self-service equipment is restricted to the use of solvents classified as non-flammable at ordinary temperatures and only slightly flammable at higher temperatures. Other than those made for clarification, the only other changes are on the hazards of static electricity. Several changes were made to the text relating to static electricity as recommended by the NFPA Committee on Static Electricity.

COMMITTEE ON FLAMMABLE LIQUIDS.

Paul C. Lamb, *Chairman, Executive Committee,*
Lever Brothers Company, 390 Park Ave., New York 22, N. Y.

Miles E. Woodworth,† *Secretary,*
National Fire Protection Assn., 60 Batterymarch St., Boston 10, Mass.

R. H. Albisser, Manufacturing Chemists' Assn., Inc.

W. J. Baker, Conference of Special Risk Underwriters.

C. V. Batley, Bethlehem Steel Co. (Personal)

Herbert R. Bogardus, Fire Insurance Rating Organization of New Jersey.

David Hugh Bottrill, Oil-Heat Institute of America.

W. S. Brooks, Oklahoma Inspection Bur.

Dr. Edgar R. Clark, Nat'l Institute of Drycleaning.

Harold Crouch, Eastman Kodak Co. (Personal)

V. L. Crusinberry, International Assn. of Fire Chiefs.

W. H. Doyle, Factory Insurance Assn.

James J. Duggan, Union Carbide Chemicals Co. (Personal)

D. M. Dymond, Testing Laboratories, Division of Canadian Standards Assn.

E. H. Fallin, National Petroleum Assn.

H. D. Fincher, National Cottonseed Products Assn.

G. G. Fleming, Manufacturing Chemists' Assn., Inc.

Parker C. Folse, American Petroleum Institute.

Roger D. Freriks, Federation of Societies for Paint Technology.

Dale F. Gilman, Fire Marshals Assn. of North America.

J. E. Goold, National Paint, Varnish & Lacquer Assn.

Fred Hague, American Petroleum Inst.

O. C. Haier, American Petroleum Inst.

S. L. Halac, National Soybean Processors Assn.

Raymond M. Hill, Fire Marshals Assn. of North America.

Charles H. Howe, Jr., Fire Marshals Assn. of North America.

Rodger R. Jackson, Laundry & Cleaners Allied Trades Assn.

O. W. Johnson, Amer. Petroleum Inst.

C. L. Jones, National Paint, Varnish & Lacquer Assn.

Hugh V. Keepers, Fire Prevention and Engineering Bureau of Texas.

Wm. H. Van Arnum, National Board of Fire Underwriters.

W. C. Whiting, New England Fire Insurance Rating Assn.

J. H. Witte, Underwriters' Laboratories.

George F. Kennedy, Fire Marshals Assn. of North America.

Louis F. Langhurst, Vegetable Oil Extraction (Personal)

F. O. Lindemann, Improved Risk Mut.

W. S. Marsh, Factory Mutual Engineering Division.

C. H. Mayhood, Manufacturing Chemists' Assn., Inc.

J. F. McKenna, American Petroleum Inst.

W. G. McKenna, Bureau of Explosives, Association of American Railroads.

L. S. Miller, Oil Insurance Assn.

J. W. Morris, Jr., South-Eastern Underwriters Assn.

J. H. Myers, American Petroleum Inst.

C. D. Norris, American Petroleum Inst.

Dean Olds, Institute of Appliance Mfrs.

R. M. Patton, Joseph E. Seagram & Sons, Inc. (Personal)

W. R. Powers, NFPA Committee on Fur Cleaning and Storage (ex-officio)

George Prussing, Consulting Engineer (Personal)

George A. Quandee, Swift & Co. (Personal)

J. Sharp Queener, National Paint, Varnish & Lacquer Assn.

Rudolph Schmidt, Jr., Assn. of Casualty & Surety Cos.

E. J. Sestak, Factory Insurance Assn.

Paul R. Sheffer, The American Oil Chemists' Society.

T. T. Singer, Western Actuarial Bureau.

Allan R. Smith, National Truck Tank and Trailer Tank Institute, Steel Tank Institute.

E. C. Sommer, American Petroleum Institute.

S. F. Spence, Manufacturing Chemists' Assn., Inc.

G. H. Steel, Ralston Purina Co. (Pers.)

C. Austin Sutherland, National Tank Truck Carriers, Inc.

R. A. W. Switzer, Dominion Fire Commissioner, Ottawa.

E. F. Tabisz, Underwriters' Laboratories of Canada.

J. Milton Wright, American Reciprocal Insurers.

T. H. Wright, Ohio Inspection Bureau.

Dr. M. G. Zabetakis, Explosives Research Laboratory, Bur. of Mines.

†Nonvoting Member.

Standard for Dry Cleaning Plants

CONTENTS

STANDARD FOR DRY CLEANING PLANTS

NFPA No. 32

INTRODUCTION

1. Purpose.

This standard 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.

This standard 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 this standard.

3. Definitions:

APPROVED signifies acceptance, by the authority having jurisdiction, of design, equipment, installation, or intended use as required by this standard.

NOTE: Devices having been tested and accepted for a specific purpose by a nationally recognized testing laboratory may be deemed to be acceptable.

BONDED OR GROUNDED shall mean either that a bond or ground has been deliberately applied, or that an electrically conductive path having a resistance adequately low for the intended purpose, usually one million ohms or less, is inherently present by the nature of the installation.

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 nonaqueous 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.

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

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.

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

GALLON shall mean a U. S. gallon.

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

SOLVENT CLASSIFICATION shall mean a method for classifying solvents according to fire hazard and in this standard 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

SYSTEM CLASSIFICATION shall mean, for the purpose of this standard, 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 27 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 this standard.

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.

NOTE: 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. Class I dry cleaning plants or systems utilizing solvents rated above 40 as to hazard shall be prohibited.

11. Retroactivity.

1101. The authority having jurisdiction may permit the continued use of existing Class I plants where such continued use will not constitute a distinct hazard to life or adjoining property.

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 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 a blank wall having a fire-resistance rating of at least four hours, 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. 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 six 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, and shall be ventilated in accordance with paragraph 2301. 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, Heat, Light and Power.

2301. A mechanical system of ventilation shall be installed in dry cleaning areas in accordance with the Standard 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 signaling equipment, and other fixed and portable devices, located eight 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, overcurrent devices, switches and other electrical devices, if installed or used 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 devices, located within eight 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 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. Openings into boiler rooms shall be at least 10 feet from any exterior openings into the cleaning room.

*Available from NFPA Publications Service Dept.

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 Flammable Liquids Code NFPA No. 30,* 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.

2402. For static protection on tanks, purifiers, clarifiers and filters see Paragraph 2614.

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.

2420. Filters shall be installed and operated as follows:

2421. Pressure type filters shall be equipped with a reliable pressure gauge which shall be regularly checked for accuracy 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 vent line. Such air bleeding lines 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 reliably protected against physical damage.

*Available from the NFPA Publications Service Dept.

25. Pumps and Piping.

2501. 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.

2502. 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.

2503. 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.

2504. 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.

2505. 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.

2506. Piping, valves, fittings and ground joint unions 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. Cast iron fittings for pressure piping shall be prohibited. 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.

2507. For static protection on pump and piping installations see Paragraph 2614.

26. Washers, Stills and Condensers, Drying Tumblers and Cabinets, Extractors and Combination Dry Cleaning Units.

2610. All apparatus of this class shall be in accordance with the following general requirements:

2611. Apparatus shall be approved by the authority having jurisdiction.

2612. Apparatus shall be installed and connected in accordance with the Flammable Liquids Code, NFPA No. 30.*

*Available from the NFPA Publications Service Dept.

2613. All liquid-handling parts such as washers, extractors, filters, button traps, and moisture separators shall be constructed to prevent leakage of solvent.

2614. Storage tanks, treatment tanks, purifiers, pumps, piping, washers, extractors, drying tumblers, drying cabinets, combination units, and other such equipment, if not inherently electrically conductive, shall be bonded together. This system of equipment, if it is not grounded due to the electrical power services installed thereon, shall be grounded. Isolated units of equipment such as drying cabinets shall be grounded.

NOTE: See Static Electricity, NFPA No. 77M, for additional information on static protection (available from NFPA Publications Service Dept.).

2615. When pulleys and belting are used in dry cleaning rooms, static electricity shall be mitigated by the installation of properly grounded combs, collectors or neutralizers.

2616. Special consideration shall be given to the generation and accumulation of static electricity in the handling of fabrics, since a free charge may exist on the surface of the solvent when in equipment such as washers or extractors. When fabrics are transferred from one piece of equipment to another, the two pieces of equipment shall be electrically bonded together.

2617. Consideration shall be given to the dissipation of static accumulations on personnel performing dry cleaning operations.

2620. Washing machines, in addition to complying with the preceding general requirements (Section 2610) shall be in accordance with the following:

2621. Washing machines shall be of substantial construction and provided with splash-proof doors and shall be provided with interlocks to prevent cylinder rotation under power except for inching when doors are open.

2622. 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.

2623. Washing machines shall be securely attached to the floor.

2624. Individual button and lint traps shall be provided for each washer.

2625. The supply pipes to washing machines whether from pumps, filters or storage tanks, shall enter the washing machines above the charged liquid level.

2626. Each washing machine shall be provided with approved extinguishing equipment, arranged to operate automatically in case of fire such as a carbon dioxide system installed in accordance with the Standard for Carbon Dioxide Extinguishing Systems* (NFPA No. 12) or a steam jet not less than ¾ inch with a continuously available steam supply at a pressure of not less than 15 pounds per square inch.

2630. Stills and condensers, in addition to complying with the preceding general requirements (Section 2610) shall be in accordance with the following:

2631. 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.

2632. Stills and condensers shall be liquid and gas-tight.

2633. Stills shall be designed for operation on the vacuum principle.

2634. If a relief valve is provided it shall be equipped with a vent line extending to the outside.

2635. A check valve shall be installed in the steam line between the boiler and the still.

2636. Each still shall be provided with a combination vacuum and pressure gauge.

2637. Each still shall be equipped with a constant level valve to automatically maintain the solvent liquid level in the still at the proper height.

2640. Drying tumblers and drying cabinets, in addition to complying with the preceding general requirements (Section 2610) shall be in accordance with the following:

2641. 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 one square foot for each 30 cubic feet of cylinder volume. Hatches shall be arranged to open away from the operator.

*Available from the NFPA Publications Service Dept.

2642. Drying tumblers shall be provided with a steam jet, of not less than ⅜ inch pipe size, for humidifying during the drying process.

2643. 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.

2644. Discharge pipes shall not terminate within ten feet measured horizontally from any door, window or frame walls of any adjoining or adjacent building.

2645. 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.

2646. 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 2627.

2650. Extractors, in addition to complying with the preceding general requirements (Section 2610) shall be in accordance with the following:

2651. Extractors shall be of substantial construction and securely attached to rigid noncombustible supports.

2652. The baskets shall have a rim of non-ferrous metal and shall be well balanced.

2653. Extractors shall be provided with liquid tight covers, preferably of non-ferrous metal, 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.

2654. Extractors shall be provided with a drain pipe not less than 1½ 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.

2655. Brakes, if used, shall be so designed as to prevent the creation of sparks or excessive heat.

2656. 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.

2660. Extractors may be equipped with a solvent spray nozzle for the purpose of spray rinsing of garments after the primary extraction if the following requirements are complied with. Installation of such spray rinse equipment on existing extractors in the field is permitted only when specific approval of the authority having jurisdiction is obtained.

2661. Extractor covers shall be made splash proof to prevent leakage of the solvent, and equipped with a latch to hold the cover closed during operation.

2662. Supply pumps shall be of approved type and, if positive displacement type shall be provided with a bypass and relief valve set so as to prevent excessive pressure.

2663. Where the solvent line is connected to the nozzle at the cover, flexible hose may be used provided it is of reinforced construction of a material suitable for the solvent handled and arranged to prevent excessive flexing.

2664. Valves in supply line between pump and outlet shall be installed in such a manner that the cutoff is effected ahead of any flexible portion of the supply line.

2665. Regardless of the intended use or number, extractor drain lines shall not be less than two inches for extractors up to and including 40 inches in diameter and three inches for extractors in excess of 40 inches in diameter.

2666. Extractors shall be provided with at least one drain line open at all times. If more than one drain line is provided, a quick opening valve or equivalent shall be installed in each line and all valves shall be interlocked so that at least one of the valves is open.

2667. If a separate extractor drain tank is provided, it shall have a capacity equal to the combined total gallonage of the charged solvent extraction, the rinse and the rinse extraction.

2668. Drainage from extractors to all tanks shall be by gravity flow.

2670. Combination dry cleaning units, wherein the washing and extracting cycles are completed within the same enclosure, in addition to complying with the general requirements (Section 2610) shall be in accordance with the following:

2671. Machines shall be of substantial construction designed to prevent distortion or objectionable vibration when machine is in normal operation.

2672. Machines shall be provided with splash proof doors, or covers, with interlocking means to prevent cylinder rotation, under power, except for inching at slow speed, when doors or covers are open.

Such interlock shall provide that during the extracting cycle, opening of the door or cover will disconnect the drive motor and apply braking means to bring the cylinder to rest before access to cylinder is possible. Machine shall be provided with braking means to insure such stoppage within reasonable time.

Each 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 machine so that the top of the overflow is below the bottom of the trunnion shaft and arranged to discharge to an underground tank.

2673. Machines shall be securely attached to the floor and when necessary a special foundation provided to prevent transmission of stresses resulting from high speed operation during extraction, to surrounding areas.

2674. Individual button and lint traps shall be provided for each machine.

2675. The supply pipes to machines, whether from pumps, filters or storage tanks, shall be arranged to deflect solvent stream away from tub openings.

2676. Each 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 Standard for Carbon Dioxide Extinguishing Systems,* NFPA No. 12, or a steam jet not less than ¾ inch with a continuously available steam supply at a pressure of not less than 15 pounds per square inch.

*Available from the NFPA Publications Service Dept.

2677. Cylinder shall be supported so as to provide sufficient clearance to prevent striking or rubbing adjacent parts during rotation.

2678. Machine shall be furnished with nameplate indicating maximum allowable operating cylinder speed and warning that machine shall not be operated in excess of such speed. Plate should also note that door or cover shall not be opened until cylinder has come to rest upon completion of the extracting cycle. Machine shall be furnished with automatic or manual means for control of the cyclic sequential operation of the unit.

27. Scouring or Brushing and Spotting.

2701. 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.

2702. Scouring or brushing operations utilizing solvents rated above 40 shall be conducted in separate one-story buildings complying in all respects with the requirements of Sections 21, 22 and 23, unless the quantity of such solvent used for this purpose does not exceed one gallon. Scouring, brushing and scrubbing in such separate buildings shall be done in conformity with the requirements of this section.

2703. No washing or scrubbing with solvents rated above 40 shall be carried on in any Class II plant.

2704. The brushing (prespotting) table shall have a liquid-tight top with a curb on all sides not less than one 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.

2705. 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.

2706. 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 three gallons. Scrubbing tubs shall be secured to the floor and shall be provided with permanent 1½ inch trapped drains to a suitable container especially provided and marked for that purpose.

2707. Metal tops of spotting tables shall be permanently and effectively grounded.

28. Operating Requirements.

2801. All employees shall be thoroughly instructed as to the hazards involved in their departments and in the work which they perform.

2802. Clothing shall be thoroughly searched in the receiving room and all foreign materials, especially matches and metallic substances, removed.

2803. 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.

2804. 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.

2805. Flammable liquids shall not be used for cleaning floors.

2806. Smoking shall be strictly prohibited except at designated smoking areas. "No Smoking" signs shall be posted.

2807. On the discovery of fire, the ventilating system shall be shut down immediately.

2808. 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.

29. Fire Protection.

2901. Suitable first aid fire protection shall be provided in accordance with the Standard for Portable Fire Extinguishers,* NFPA No. 10. The provision of automatic fire extinguishing systems is recommended.

2902. Approved portable fire extinguishers of a type suitable for use on flammable liquid fires shall be provided for every room or area where flammable liquids are used.

*Available from the NFPA Publications Service Dept.

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.

3101. 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 tanks installed underground, or in enclosures or casings constructed in accordance with Section 2320 of the Flammable Liquids Code, NFPA No. 30.

3402. Inside aboveground processing equipment units containing solvent shall have an individual capacity not in excess of

*Available from the NFPA Publications Service Dept.

275 gallons. The total operating solvent capacity of the plant, including 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.

3406. For static protection of tanks and filters see Paragraph 3615.

3410. Filters shall be installed and operated as follows:

3411. Pressure type filters shall be equipped with a reliable pressure gauge which shall be regularly checked for accuracy 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 vent line. Such air bleeding lines 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, fittings and ground joint unions 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. Cast iron pipe fittings such as ells, tees, crosses, couplings and unions shall be prohibited. 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.

3506. The transfer of solvent from the shipping or supply drums to the system during the initial charging or whenever replenishing the solvent supply shall be accomplished by utilizing either the system circulating pump and piping or a separate pump and piping so as to comply with the Flammable Liquids Code, NFPA No. 30.*

3507. For static protection on pump and piping installations see Paragraph 3615.

36. Washers, Stills and Condensers, Drying Tumblers or Cabinets, Extractors and Combination Dry Cleaning Units.

3610. All apparatus of this class shall be in accordance with the following general requirements:

3611. Apparatus shall be installed and connected in accordance with the Flammable Liquids Code, NFPA No. 30.*

3612. Apparatus shall be of substantial construction, shall be securely mounted on rigid noncombustible supports securely attached to the floor.

3613. All liquid-handling parts such as washers, extractors, filters, button traps, and moisture separators, shall be constructed to prevent leakage of solvent. When washers are constructed using bolted covers which extend below the normal solvent level in the machine, the joints shall be designed to withstand vibration and gaskets shall be of a material suitable for the solvent handled.

*Available from the NFPA Publications Service Dept.

3614. All pulleys, belting, gears, and other rotating or oscillating parts shall be enclosed in suitable guards unless their locations in the final assembly are such that the operators are not likely to come in contact with them.

3615. Storage tanks, treatment tanks, purifiers, pumps, piping, washers, extractors, drying tumblers, drying cabinets, combination units, and other such equipment, if not inherently electrically conductive, shall be bonded together. This system of equipment, if it is not grounded due to the electrical power services installed thereon, shall be grounded. Isolated units of equipment, such as drying cabinets, shall be grounded.

NOTE: See Static Electricity, NFPA No. 77M, for additional information on static protection (available from NFPA Publications Service Dept.).

3616. Special consideration shall be given to the generation and accumulation of static electricity in the handling of fabrics, since a free charge may exist on the surface of the solvent when in equipment such as washers or extractors. When fabrics are transferred from one piece of equipment to another, the two pieces of equipment shall be electrically bonded together.

3617. Consideration shall be given to the dissipation of static accumulations on personnel performing dry cleaning operations.

3620. Washing machines, in addition to complying with the preceding general requirements (Section 3610) shall be in accordance with the following:

3621. Washing machines shall be of substantial construction and provided with splash-proof doors and shall be provided with interlocks to prevent cylinder rotations under power except for inching when doors are open.

3622. Each washing machine shall be provided with an overflow pipe one size larger than the size of the solvent supply line of the washer. Such overflow 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 or to a suitable aboveground container. Such aboveground container shall be emptied at the end of each day's work and oftener if necessary.

3623. The supply pipe shall enter the washing machine above the charged liquid level.

3624. Each washer shall be provided with a substantially constructed button and lint trap to prevent foreign matter from entering tanks or pumps. Button and lint traps shall be equipped with suitable lids.

3630. Stills and condensers, in addition to complying with the preceding general requirements (Section 3610) shall be in accordance with the following:

3631. Steam or hot water only shall be used as a source of heat. If steam is used, a pressure regulating valve shall be installed in the steam supply line to the still.

3632. Stills and condensers shall be liquid and gas-tight.

3633. Stills shall be designed for operation on the vacuum principle.

3634. If a relief valve is provided it shall be equipped with a vent line extending to the outside.

3635. A check valve shall be installed in the steam line between the boiler and the still.

3636. Each still shall be provided with a combination vacuum and pressure gauge.

3637. Each still shall be equipped with a constant level valve to automatically maintain the solvent liquid level in the still at the proper height.

3640. Drying tumblers and drying cabinets in addition to complying with the preceding general requirements (Section 3610) shall be in accordance with the following:

3641. Drying tumblers and drying cabinets shall be constructed so that the solvent is removed from the fabrics and the machine (by evaporation and dilution with heated air flow) without the formation of flammable mixtures of vapor and air.

3642. The air-flow temperature shall be below the flashpoint of the solvent while the machine is being loaded or unloaded.

3643. A motor-driven fan for inducing air flow, heating coils, and the necessary automatic controls and interlocks shall be integral parts of the machine. The door shall be automatically locked in the closed position if the temperature exceeds the flash-

point of the solvent and can be released only when the temperature drops below the flashpoint temperature.

3644. In the event of electric power failure, the interior of the drying tumbler or cabinet shall be automatically flooded with steam until the electric service is restored and the temperature within the tumbler or cabinet is below the flashpoint of the solvent.

3645. Steam or hot water only shall be used to secure the necessary temperatures in the drying tumblers and cabinets.

3646. The fan incorporated in a drying tumbler or drying cabinet shall be properly housed and so interlocked as to assure operation while the machine 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.

3647. Drying tumblers and cabinets shall be ventilated to the outside air by means of properly constructed pipes and ducts connected to the exhaust side of the fan incorporated in the machine. Such discharge pipes shall be carried to a height of not less than six feet above the roof. Discharge pipes shall not terminate within ten feet measured horizontally from any door, window, or frame wall of any adjoining building.

3648. Drying tumblers shall be provided with interlocks so that the cylinders cannot be power driven while the access door is open. Opening the access door shall automatically stop the cylinder drive motor.

3650. Extractors, in addition to complying with the preceding general requirements (Section 3610) shall be in accordance with the following:

3651. The baskets shall have a rim of non-ferrous metal and shall be well balanced.

3652. Extractors shall be provided with liquid-tight covers, preferably of non-ferrous metal, 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.