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Standards for Safeguarding DRY CLEANING AND DRY DYEING PLANTS

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National Fire Protection Association

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. This pamphlet is one of a large number of publications on fire safety issued by the Association.

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Dry Cleaning.

This standard was originally prepared by the Committee on Flammable Liquids in 1924 and 1925, in cooperation with the National Association of Dyers and Cleaners. The first edition was adopted by the Association in 1925. Amendments were adopted in 1927 and complete revised editions in 1936 and 1944. These standards have been adopted by the National Board of Fire Underwriters and published by them in separate pamphlet form in editions dated 1925, 1936 and 1944.

STANDARDS FOR SAFEGUARDING DRY CLEANING AND DRY DYEING PLANTS.

Definitions.

1. Dry cleaning shall be considered as 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. Methods of dry cleaning include:

a. Immersion and agitation in open vessels;

b. Immersion and agitation in closed machines;

c. "Spotting" or local application of flammable liquid solvents to spots of dirt, grease, paints and stains not removed by the immersion and agitation process;

d. "Brushing" or "scouring" with flammable solutions.

2. Dry dyeing shall be considered as the process of dyeing clothes or other fabrics or textiles in a solution of dye colors and flammable liquids.

3. In the standards which follow, wherever reference is made to "dry cleaning," it shall be construed as applying to both dry cleaning and dry dyeing operations.

Section 10. General Requirements.

11. Except as provided in Rule 83 (*b*), dry cleaning by immersion and agitation in open vessels is prohibited.

12. Dry cleaning by immersion and agitation in closed machines should be carried on with approved machinery and equipment installed and operated in accordance with the following standards.

13. Before any dry cleaning plant is established or before an existing plant is remodeled, complete drawings shall be submitted to the inspection department having jurisdiction for examination and approval.

14. These drawings should be drawn to an indicated scale, give relative location of dry cleaning building, boiler room, finishing building or department, storage tanks for solvents, pumps, washers, drying tumblers, extractors, filter traps, stills, condensers, piping, etc., show sectional elevation of the buildings (including lowest floors or pits, tanks, their fittings, devices, etc.). Specifications based on the following rules should accompany the drawings.

15. As a means of determining the class of installation into which a dry cleaning system may fall, the following schedule developed by Underwriters' Laboratories 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

16. For the purpose of these standards, dry cleaning installations shall be arranged in four classes according to the foregoing hazard scale as follows:

CLASS I—Systems utilizing solvents rated above 40.

CLASS II—Systems utilizing solvents rated 40 or below but which do not comply with Class III or Class IV requirements.

CLASS III—Systems employing equipment approved by Underwriters' Laboratories utilizing listed solvents having specified characteristics and rated at 25 or below.

CLASS IV—Systems utilizing solvents classified as non-flammable, or as non-flammable at ordinary temperatures and only slightly flammable at higher temperatures (rated not over 5).

CLASS I.

Dry cleaning plants utilizing solvents rated above 40 as to hazard shall be designated as Class I installations and shall comply with the following requirements.

Section 110. Location.

111. Dry cleaning plants should preferably 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 cleaning building is of standard brick or equivalent construction and without openings it may be located on the property line but in no case shall more than two sides have blank walls.

Section 120. Construction of Buildings in Which Dry Cleaning Is Carried On.

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

122. Walls shall be 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. Wired glass for windows shall be in sash so hung that they will readily swing out in case of an explosion. Such sash shall not be secured. Glass area in walls shall be so located as to vent the force of any explosion in the direction or directions of least exposure.

123. Floors shall not be below grade and shall have no pits, wells, and pockets. The wearing surface shall be of a non-combustible material, preferably of non-sparking type.

124. Roof shall be flat, of fire-resistive construction. If due to local conditions it is desirable to vent possible explosions upward, the roof shall be of light construction and of non-combustible material.

125. Skylights shall be provided. They shall be constructed of metal frame and sash and be provided with wire glass. The sash shall be of the pivot type, and so hung as to readily swing out in case of an explosion; or in lieu thereof, the skylights may be constructed of metal frame and sash and be provided with plain thin glass with a wire screen provided above the skylights.

126. Drying rooms if under the same roof as the dry cleaning rooms shall be separated from such rooms by a fire-resistive wall.* The entrance to such drying room or rooms shall be provided with standard, self-closing fire doors. Ventilation and provisions for extinguishment for such drying rooms shall conform to the requirements for ventilation and fire extinguishment for dry cleaning buildings. If the drying room is in a separate building it shall conform in construction and equipment to all requirements for dry cleaning buildings.

Section 130. Ventilation, Air Conditioning, Lighting, Heating.

131. A mechanical system of ventilation shall be installed in accordance with the standards for Blower Systems† 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.

132. Exhaust and ventilating fan motors in ventilating systems shall be of the explosion-proof type approved for Class I, Group D, hazardous locations as defined in the National Electrical Code.

133. The spiders, blades or all running rings of exhaust fans shall be of non-ferrous metal.

134. All wiring shall be in rigid conduit installed in accordance with the rules of the National Electrical Code for Class I hazardous locations. Lighting fixtures, portable lights, switches and other devices shall be of the explosion-proof type approved for Class I, Group D, hazardous locations as defined in the National Electrical Code.

135. Heating shall be by steam or hot water only. Steam and hot water pipes and radiators for heating and drying purposes shall be at least one inch from all woodwork and shall be protected by substantial metal screens arranged so as to prevent combustible goods or materials from coming in contact with such pipes and radiators.

136. All 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 inspection department having jurisdiction.

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

138. A reliable form of hygrometer of the sling psychrometer type shall be installed in each room to indicate the relative humidity of the air.

139. The psychrometer shall be read at least hourly.

*See requirements for fire partitions—Building Code, National Board of Fire Underwriters.

†See National Fire Codes, Vol. III, published by NFPA and separate pamphlet No. 91.

Section 140. Power.

141. Electric motors, motor controllers, overcurrent devices, switches and other electrical devices, if installed in dry cleaning rooms or other hazardous areas, shall be of the explosion-proof type approved for Class I, Group D, hazardous locations as defined in the National Electrical Code.

142. Boilers shall be located when possible in a detached building. When in a building adjoining cleaning rooms, the boiler building shall be cut off therefrom by an unpierced brick wall at least twelve inches thick, or equivalent.

Section 150. Tanks, Purifiers, Clarifiers.

151. All solvent storage tanks shall be underground and installed and equipped in accordance with the National Fire Protection Association's Suggested Ordinance on Flammable Liquids.*

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

(a) Such containers shall not have an individual capacity in excess of 350 gallons.

(b) Containers shall be securely mounted on rigid incombustible supports.

(c) 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.

(d) Containers shall be permanently and effectively grounded.

(e) Each aboveground container shall be provided with an automatic heat actuated emergency drain connection of ample capacity to discharge the entire contents to the underground storage tanks within a period of five minutes.

153. Clarifiers shall be installed and operated as follows:

(a) 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.

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

(c) 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 name plate of machine. Steam driven clarifiers shall be equipped with approved governors.

(d) All sight glasses used in conjunction with clarifiers in the continuous system, 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 mechanical injury.

(e) Pumps used in conjunction with clarifiers on the continuous system of clarification shall be properly designed and substantially constructed, and when of the piston, rotary or gear type shall be fitted with a relief valve and by-pass set so as to prevent excessive pressure.

*See also NBFU Pamphlet No. 30—Standards for Containers for Storage and Handling of Flammable Liquids.

(f) 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.

(g) All clarifiers shall be periodically inspected and repairs made if necessary.

Section 160. Pumps, Pipe Manifold for Handling Solvents, Washers, Drying Tumblers, Extractors, Separators and Stills.

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

(a) Apparatus shall be approved by the inspection department having jurisdiction.

(b) Apparatus shall be installed and connected in accordance with the National Fire Protection Association's Suggested Ordinance for Flammable Liquids.*

(c) All washers, extractors, treating tanks, clarifiers, separators and stills shall be liquid tight.

(d) 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.

(e) Gauge glasses, and look boxes or windows, 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 mechanical injury.

(f) A separate suction and discharge connection shall be provided to the pump 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 catch basin.

(g) 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 inspection department having jurisdiction.

(h) All piping shall be tested to a pressure of at least fifty pounds and proven tight and otherwise protected against mechanical injury.

(i) Individual button and lint traps shall be provided for each washer and a master strainer shall be installed in the main waste line.

162. Washing machines, in addition to complying with the preceding general requirements (Rule 161), shall be in accordance with the following:

(a) The cylinders and shells of all washing machines shall be permanently and effectively grounded. The grounding of the cylinder in each case shall be through the end of the shaft and across the surface of the cylinder.

(b) 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 bearings, shall be without shut-off valves, and shall be arranged to discharge to an underground tank.

(c) Washing machines shall be of substantial construction and provided with splash-proof doors of the outside case hinge type arranged to be self-closing or automatic closing.

(d) Washing machines to be securely attached to the floor.

*See also NBFU Pamphlet No. 30—Standards for Containers for Storage and Handling of Flammable Liquids.

(e) The supply pipes to washing machines whether from pumps, filters, clarifiers or storage tanks shall enter the washing machines above the charged liquid level where the top of such apparatus or container is above the charged liquid level.

163. Stills and condensers, in addition to complying with the preceding general requirements (Rule 161), shall be in accordance with the following:

(a) Stills, condensers and treating tanks shall be of substantial construction, mounted on substantial fire resistive foundation or framework and shall be of a type which will not expose the liquid during any part of the process of reclamation. Steam or hot water only shall be used to secure the necessary temperature. Stills and condensers shall be liquid and gas tight.

(b) Each still shall be equipped with a vacuum and pressure relief valve arranged to discharge outside of the building. Relief valves shall be not less than 1½ inches and set at not over five pounds. When a shut-off valve is installed between still and condenser the relief valve shall be located on the still side of shut-off valve. A check valve shall be installed in the steam line between the boiler and the still.

(c) 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.

164. Drying tumblers, in addition to complying with the preceding general requirements (Rule 161) shall be in accordance with the following:

(a) Drying tumblers shall be of substantial construction, well secured to substantial foundations, shall be vapor tight, and shall be provided with self-closing explosion hatches having an area equal to at least 10 per cent of the total area of the cylinders, excluding the ends. Hatches shall be arranged to open away from the operator.

(b) The cylinder and shell of all drying tumblers shall be permanently and effectively grounded. The grounding of the cylinder in each case shall be through the end of the shaft.

(c) Drying tumblers shall be provided with a steam jet, of not less than ⅜-inch size, for steaming during the drying process.

(d) Drying tumblers shall be ventilated to the outside air by means of properly constructed pipes and ducts connected to an exhaust fan of sufficient capacity to remove all dust, vapors, or fibres generated by the process. Such discharge pipes shall be carried to a height of not less than six feet above the roof.

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

(f) 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.

165. Extractors, in addition to complying with the preceding general requirements (Rule 161), shall be in accordance with the following:

(a) Extractors shall be of substantial design and construction and securely attached to rigid incombustible supports.

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

(c) Extractors shall be provided with a cover of non-ferrous metal or brass screen held in a substantial frame.

(d) 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.

(e) The outside shell of extractors shall be permanently and effectively grounded.

(f) Brakes, if used, shall be so designed as to prevent the striking of sparks or developing of excessive heat.

Section 170. Scouring or Brushing and Spotting.

171. All scouring or brushing operations shall be carried on in the dry cleaning room or in a separate fire-resistive compartment with wall openings to the outside only.

172. The scouring or brushing 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 so pitched as to ensure thorough draining to a 1½-inch drain connection with liquid seal trap direct to underground tank. Metal tops where used shall be liquid tight, and permanently and effectively grounded. The table shall be secured to the floor or wall so as not to disturb the grounding and drain connections.

173. (a) 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.

(b) 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. Solvents for this purpose shall be stored in approved safety cans and returned to settling tanks as soon as the operation is completed. Scrubbing tubs shall be secured to the floor and shall be provided with permanent 1½-inch trapped drains to underground tanks.

174. Flammable solvents used in connection with spotting operations shall be limited to one quart and shall be stored in and applied from an approved safety can.

Section 180. Operating Requirements.

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

182. All clothes, when received at the plant, shall be thoroughly searched in the receiving room and all foreign materials, especially matches and metallic substances, removed.

183. Before removing the batch of clothes from a washer a non-ferrous metal drip apron should be placed so as to rest on the metal basket of the truck and the cylinder of the washer.

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

185. Smoking on the premises shall be strictly prohibited and "No Smoking" signs shall be posted.

186. (a) 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 safely disposed of. At all other times the trap covers shall be kept securely in place.

(b) All aboveground containers such as washing machines, tanks, purifiers, clarifiers, stills and condensers shall be drained of all solvents immediately after the close of each day.

187. (a) On the discovery of fire the ventilating system shall be shut down immediately.

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

188. So far as feasible sludge deposits formed in treating tanks, stills or any other receptacle shall be free from volatile flammable liquids before being drawn from their containers.

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

Section 190. Fire Protection.

191. 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 inspection department having jurisdiction.

192. Approved extinguishing devices of a type suitable for use on oil fires shall be provided for every room or area where flammable liquids are stored or used. These may be hand extinguishers, and, if necessary, wheeled extinguishers, depending upon the size of the plant. Extinguishers shall be of Class B type, installed and maintained in accordance with the Standards for First Aid Fire Appliances.* 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 stored or used.

193. Each dry cleaning room and drying room shall be equipped with an approved extinguishing system, of one of the following types:

(a) An automatic sprinkler system installed in accordance with the Standards for the Installation of Sprinkler Equipments.*

(b) A carbon dioxide room flooding system installed in accordance with the Standards for Carbon Dioxide Fire Extinguishing Systems.*

(c) A steam smothering system, manually controlled by means of a quick opening valve from a conveniently accessible point outside the room protected, with continuously available steam supply at a pressure of at least 15 pounds per square inch and discharge piping and outlets sufficient to deliver 8 pounds of steam per minute per 100 cubic feet of volume of the space protected.

NOTE I: The use of steam for fire extinguishment is not generally satisfactory except in very small spaces which are or can be completely closed, such as in drying cabinets, drying tumblers, etc. For effective protection in dry cleaning rooms of similar large spaces, the quantities of steam required to accomplish extinguishment are usually so excessive as to make it unlikely that adequate boiler capacity can be made available.

NOTE II: One pound of steam per minute is equivalent to two boiler horsepower.

Steam discharge through orifices with a supply pressure of not less than 15 pounds per square inch may be calculated by the following formula:

$$W=0.7a\ (P+15).$$

Where W=pounds of steam per min.
A=area of outlet in sq. in.
P=gauge pressure at outlet in lbs. per sq. in.

*National Fire Codes, Vol. IV, published by N.F.P.A.

194. Each washing machine shall be provided with approved extinguishing equipment, arranged to operate automatically or by remote control, consisting of a carbon dioxide system in accordance with the Standards for Carbon Dioxide Fire Extinguishing Systems* 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.

195. Each drying tumbler shall be provided with approved extinguishing equipment, arranged to operate automatically and by remote control, consisting of a carbon dioxide or steam jet system as specified in paragraph 194.

CLASS II.

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.

NOTE: 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.

Section 210. Location.

The requirements of this section are based upon locations in unsprinklered buildings; at the discretion of the inspection department having jurisdiction they may be modified if the building is protected throughout by means of an approved automatic sprinkler system.

211. Dry cleaning plants should preferably be located in outlying sparsely built sections, but when located in congested districts shall be not closer than ten feet to the line of adjoining property, unless the exposing wall of the plant is of blank masonry construction.

212. 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 class as "other occupancies," for the purpose of this rule.

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

Section 220. Construction.

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

222. 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 non-combustible material and where located over a basement, floor shall be vapor and liquid tight.

223. (a) Roof and floors above grade floor should preferably be of fire-resistive or incombustible 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 a one-hour fire resistance classification.

(b) Doorways opening on stairs leading to basement, or opening into rooms having openings or stairs to basements, shall be provided with noncombustible sills raised at least 6 inches; approved self-closing fire doors shall be provided at such openings.

224. Where incidental operations, such as permitted under paragraph 212, are located on the same floor with dry cleaning plants, the dry cleaning

*National Fire Codes, Vol. IV, published by N.F.P.A.

operations shall be cut off therefrom by fire partitions capable of providing one hour's resistance to fire, 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 rule.

NOTE: The requirements of paragraph 224 may be waived at the discretion of the inspection department having jurisdiction based upon a consideration of such factors as type of building construction involved, nature of operations, and extent of private protection provided.

225. 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 one hour's resistance to fire, 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.

Section 230. Ventilation, Lighting, Heating.

231. A mechanical system of ventilation shall be installed in accordance with the Standards for Blower Systems* 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.

232. Exhaust and ventilating fan motors in ventilating systems shall be of the explosion-proof type approved for Class I, Group D, hazardous locations as defined in the National Electrical Code.

233. The spiders, blades or all running rings of exhaust fans shall be of non-ferrous metal.

234. All electric wiring in dry cleaning rooms or other sections subject to flammable vapors shall be in rigid conduit installed in accordance with the requirements of the National Electrical Code for Class I hazardous locations, and all lighting fixtures, portable lights, switches and other electrical devices located within 8 feet of the floor shall be of the approved Class I, Group D, explosion-proof type.

235. Heating in dry cleaning rooms shall be by steam or hot water only, with pipes and radiators installed with adequate clearances and properly protected where necessary against contact with combustible goods or materials.

Section 240. Power.

241. Electric motors, motor controllers, overcurrent devices, switches, and other electrical devices, if installed in dry cleaning rooms or other areas subject to flammable vapors, shall be of the explosion-proof type approved for Class I, Group D hazardous locations as defined in the National Electrical Code.

242. Boilers shall be located when possible in a detached building. When in a building adjoining cleaning rooms the boiler building shall be cut off by an unpierced brick wall at least twelve inches thick, or equivalent.

Section 250. Tanks, Purifiers, Clarifiers, Filters.

251. All solvent storage tanks shall be underground or in approved enclosures installed and equipped in accordance with the N.F.P.A.† Suggested Ordinance on Flammable Liquids, except that inside (aboveground) storage tanks may be used provided the aggregate capacity of the storage

*National Fire Codes, Vol. III, published by NFPA and separate pamphlet No. 91.

†See also N.B.F.U. Pamphlet No. 30—Standards for Containers for Storage and Handling of Flammable Liquids.

tanks does not exceed 550 gallons and the individual capacity of any storage tank does not exceed 275 gallons.

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

(a) 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.

(b) Containers shall be securely mounted on rigid incombustible supports.

(c) Containers shall be provided with 1¼-inch vent pipes extending to the outside of the building.

(d) Containers shall be permanently and effectively grounded.

(e) Each aboveground container shall be provided with an automatic, heat actuated emergency drain connection of ample capacity to discharge the entire contents to the underground storage tanks within a brief period.

NOTE: This requirement may be disregarded in systems where solvent storage is entirely in aboveground tanks of limited capacity as provided in Par. 251 for Class II systems.

253. Clarifiers shall be installed and operated as follows:

(a) All overhead tanks used for supply purposes to clarifiers operating on the batch clarification system shall be limited to 350 gallons capacity and shall in no event exceed in capacity any individual storage tank to which they may be connected.

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

(c) 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 name plate of machine. Steam driven clarifiers shall be equipped with approved governors.

(d) All sight gauge glasses used in connection with clarifiers shall be of a type not readily damaged by heat and shall be reliably protected from breakage and mechanical injury.

(e) Pumps used in conjunction with clarifiers on the continuous system of clarification shall be properly designed and substantially constructed, and when of the piston, rotary or gear type shall be fitted with a relief valve and by-pass set so as to prevent excessive pressure.

(f) Overhead tanks used for supply purposes to batch clarifiers, and suitable points in the pipe lines of all continuous systems shall be provided with automatic heat actuated emergency drain connections of ample capacity to discharge the entire liquid contents to the underground storage tanks within a brief period.

NOTE: This requirement may be disregarded in systems where solvent storage is entirely in aboveground tanks of limited capacity as provided in paragraph 251, for Class II systems.

(g) All clarifiers shall be periodically inspected and repairs made if necessary.

Section 260. Pumps, Pipe Manifold for Handling Solvents, Washers, Drying Tumblers, Extractors, Separators and Stills.

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

(a) Apparatus shall be approved by the inspection department having jurisdiction.

(b) Apparatus shall be installed and connected in accordance with the National Fire Protection Association's Suggested Ordinance on Flammable Liquids.*

(c) All washers, extractors, treating tanks, clarifiers, separators and stills shall be liquid tight.

(d) 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.

(e) Gauge glasses, and look boxes or windows, 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 mechanical injury.

(f) A separate suction and discharge connection shall be provided to the pump 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 catch basin.

(g) 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 inspection department having jurisdiction.

(h) All piping shall be tested to a pressure of at least fifty pounds and proven tight and otherwise protected against mechanical injury.

(i) Individual button and lint traps shall be provided for each washer and a master strainer shall be installed in the main waste line.

262. Washing machines, in addition to complying with the preceding general requirements (Rule 261), shall be in accordance with the following:

(a) The cylinders and shells of all washing machines shall be permanently and effectively grounded. The grounding of the cylinder in each case shall be through the end of the shaft and across the surface of the cylinder.

(b) 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 bearings, shall be without shut-off valves, and shall be arranged to discharge to an underground tank.

(c) Washing machines shall be of substantial construction and provided with liquid-tight doors of the outside case hinge type arranged to be self-closing or automatic closing.

(d) Washing machines to be securely attached to the floor.

(e) The supply pipes to washing machines whether from pumps, filters, clarifiers or storage tanks shall enter the washing machines above the charged liquid level where the top of such apparatus or container is above the charged liquid level.

263. Stills and condensers, in addition to complying with the preceding general requirement (Rule 261), shall be in accordance with the following:

(a) Stills, condensers and treating tanks shall be of substantial construction, mounted on substantial fire resistive foundation or framework and shall be of a type which will not expose the liquid during any part of the process of reclamation. Steam or hot water only shall be used to secure the necessary temperature. Stills and condensers shall be liquid and gas tight.

*See also NBFU Pamphlet No. 30—Standards for Containers for Storage and Handling of Flammable Liquids.

(b) Each still shall be equipped with a vacuum and pressure relief valve arranged to discharge outside of the building. Relief valves shall be not less than 1½ inches and set at not over five pounds. When a shut-off valve is installed between still and condenser, the relief valve shall be located on the still side of shut-off valve. A check valve shall be installed in the steam line between the boiler and the still.

(c) 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 brief period.

NOTE: This requirement may be disregarded in systems where solvent storage is entirely in aboveground tanks of limited capacity as provided in paragraph 251 for Class II systems.

264. Drying tumblers and drying cabinets in addition to complying with the preceding general requirements (Rule 261), shall be in accordance with the following:

(a) Drying tumblers and cabinets shall be of substantial construction on rigid incombustible supports, shall be vaportight, and shall be provided with self-closing explosion hatches of adequate area, equivalent to at least 10 per cent of the total area of cylinders, exclusive of ends, or at least 10 per cent of the combined area of sides and top of cabinets. Hatches shall be arranged to open away from the operator.

(b) The cylinder and shell of all drying tumblers and the walls of drying cabinets shall be permanently and effectively grounded. The grounding of the cylinder shall in each case be through the end of the shaft.

(c) Drying tumblers and drying cabinets shall be provided with a steam jet of not less than ⅜-inch size, for steaming during the drying process.

(d) Drying tumblers and cabinets shall be ventilated to the outside air by means of properly constructed pipes and ducts connected to an exhaust fan of sufficient capacity to remove all dust, vapors, or fibres generated by the process. Such discharge pipes shall be carried to a height of not less than six feet above the roof.

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

(f) 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.

265. Extractors, in addition to complying with the preceding general requirements (Rule 261), shall be in accordance with the following:

(a) Extractors shall be of substantial design and construction and securely attached to substantial foundations.

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

(c) Extractors shall be provided with a cover of non-ferrous metal or brass screen held in a substantial frame.

(d) 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.

(e) The outside shell of extractors shall be permanently and effectively grounded.

(f) Brakes, if used, shall be so designed as to prevent the striking of sparks or developing excessive heat.

Section 270. Scouring, or Brushing and Spotting.

271. All scouring or brushing and spotting operations should preferably be conducted with liquids or solvents having a hazard classification 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.

272. 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 172 and 173 for Class I systems.

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

Section 280. Operating Requirements.

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

282. All clothes, when received at the plant, shall be thoroughly searched in the receiving room and all foreign materials, especially matches and metallic substances, removed.

283. Before removing the batch of clothes from a washer a non-ferrous metal drip apron should be placed so as to rest on the metal basket of the truck and the cylinder of the washer.

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

285. Smoking on the premises shall be strictly prohibited and "No Smoking" signs shall be posted.

286. (a) 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 safely disposed of. At all other times the trap covers shall be kept securely in place.

(b) All apparatus and equipment such as washing machines, overhead tanks, purifiers, filters, clarifiers, stills and condensers shall be drained of all solvents immediately after the close of each day; the solvents shall be drained into the storage tanks.

287. (a) On the discovery of fire the ventilating system shall be shut down immediately.

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

288. So far as feasible sludge deposits formed in treating tanks, stills or any other receptacle shall be free from volatile flammable liquids before being drawn from their containers.

Section 290. Fire Protection.

291. Approved extinguishing devices of a type suitable for use on oil fires shall be provided for every room or area where flammable liquids are stored or used. These may be hand extinguishers, and, if necessary, wheeled extinguishers, depending upon the size of the plant. Extinguishers shall be of Class B type, installed and maintained in accordance with the Standards for First Aid Fire Appliances.* In no case shall there be less than one

*National Fire Codes, Vol. IV, published by N.F.P.A.

extinguisher of B-1 rating at each entrance of every room or area where flammable liquids are stored or used.

292. Each washing machine shall be provided with approved extinguishing equipment, arranged to operate automatically or by remote control, consisting of a carbon dioxide system in accordance with the Standards for Carbon Dioxide Fire Extinguishing Systems* 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.

293. Each drying tumbler shall be provided with approved extinguishing equipment, arranged to operate automatically and by remote control, consisting of a carbon dioxide or steam jet system as specified in Paragraph 292.

CLASS III.

Systems employing equipment approved by Underwriters' Laboratories, Inc., utilizing listed solvents rated at 25 or below with respect to fire hazard and complying with the following specifications shall be designated as Class III installations, and shall comply with the following requirements:

Flashpoint (closed cup)..... Not lower than 59.0 C. (138.2 F.)

Initial boiling point..... Not lower than 181.0 C. (357.8 F.)

Ignition temperature ..... Not lower than 234.0 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 150.0 C. (302.0 F.)

Spontaneous heating—The cleaning material shall not heat spontaneously.

NOTE I: Dry cleaning systems of this class are suitable for use only with listed cleaning liquids specified above. 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.

NOTE II: 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.

Section 310. Location.

311. (a) The requirements of this section are based upon locations in unsprinklered buildings with other occupancies.

(b) In cases 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's resistance to fire. 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 rule. All openings in such interior walls shall be protected by fire doors approved for this purpose.

NOTE: For the purpose of this rule, operations incidental to or in connection with the dry cleaning business, such as laundering, scouring, scrubbing, drying, pressing, ironing, etc., shall not class as "other occupancies."

*National Fire Codes, Vol. IV, published by N.F.P.A.

312. The requirements of paragraph 311 for construction cut-offs may be waived at the discretion of the inspection department 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.

Section 320. Light and Power.

321. Lighting shall be by electricity employing incandescent lights. Wiring for light and power shall be in rigid conduit and with all electrical equipment and devices installed in accordance with the rules of the National Electrical Code.

322. Boilers shall be located when possible in a detached building. When in a building adjoining cleaning rooms the boiler building shall be cut off by an unpierced brick wall at least 12 inches thick or equivalent.

Section 330. Capacity Limitation.

331. The total capacity of aboveground inside solvent storage tanks, including solvent treatment 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 54 of the N.F.P.A. Suggested Ordinance on Flammable Liquids.

332. The total operating solvent capacity of the system, excluding storage tanks, shall not exceed 550 gallons.

Section 340. General Requirements.

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

(a) Apparatus shall be installed and connected in accordance with the National Fire Protection Association's Suggested Ordinance on Flammable Liquids.*

(b) Apparatus shall be of substantial construction, shall be securely mounted on rigid incombustible supports, and shall be securely attached to the floor.

(c) 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.

(d) All liquid-handling parts such as tanks, washers, extractors, filters, button traps, moisture separators, and stills shall be liquid tight.

(e) Gauge glasses, and look boxes or windows shall be of a type not readily damaged by heat and shall be reliably protected from breakage and mechanical injury.

(f) Solvent storage tanks, washers, and extractor drain tanks shall be provided with a 1¼-inch pipe size vent pipe extending to the outside of the building.

(g) The cylinders and shells of all washing machines and drying tumblers and all aboveground containers shall be permanently and effectively grounded. The grounding of the cylinder in each case shall be through the end of the shaft and across the surface of the cylinder.

The walls of drying cabinets and the outside shell of extractors shall be permanently and effectively grounded.

(h) All pumps handling solvent shall be devices approved for use with hazardous liquids, and when of the piston, rotary, or gear type shall be fitted with a relief valve and by-pass set so as to prevent excessive pressures.

*See also NBFU Pamphlet No. 80—Standards for Containers for Storage and Handling of Flammable Liquids.

(i) 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 catch basin.

(j) 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.

Section 350. Tanks, Washers, Filters, Extractors, Drying Tumblers or Cabinets, Stills, and Condensers.

351. Aboveground storage tanks, in addition to complying with the preceding general requirements (Rule 341), shall be in accordance with the following:

(a) Solvent containers such as clean solvent tank, dirty solvent tank, extractor drain tank, filter, etc., shall have an individual capacity not in excess of 275 gallons.

(b) 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 mechanical injury.

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

352. Washing machines, in addition to complying with the preceding general requirements (Rule 341), shall be in accordance with the following:

(a) They shall be provided with liquid-tight doors of the case hinge type. They shall be arranged with automatic mechanical or electrical interlocks so that the washer cannot be operated unless the doors are closed and so that the power operating the washer is shut off before the doors can be opened.

(b) Each washing machine shall be provided with an overflow pipe one pipe 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 bearings, 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.

(c) The supply pipe shall enter the washing machine above the charged liquid level.

(d) 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.

353. Filters and clarifiers, in addition to complying with the preceding general requirements (Rule 341), shall be in accordance with the following:

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

(b) 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.