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DIP TANKS 1974

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Standard for

Dip Tanks

Containing Flammable or Combustible Liquids

NFPA No. 34 — 1974

1974 Edition of No. 34

This 1974 edition was adopted by the NFPA in Annual Meeting, May 20–24, on recommendation of the Committee on Finishing Processes to supersede all previous editions.

This 1974 edition represents a major revision to previous editions. Although most of the revisions were made for editorial reasons, there are a number of substantive changes in this edition.

Origin and Development of No. 34

NFPA standards on the safeguarding of dip tanks containing flammable liquids date from 1913 when standards prepared by the Committee on Explosives and Combustibles were adopted. Subsequently jurisdiction was transferred to a new Committee on Manufacturing Hazards which in turn was superseded by the present Committee on Finishing Processes.

Continued on page 34–2

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

The original 1913 edition was completely revised in 1921 and 1922 at which time hardening and tempering tanks and flow coat work were added to the original standard. Further revisions to keep the text up to date with material on various new aspects of the subject were adopted in 1922, 1926, 1936, 1940, 1946, 1952, 1957, 1959, 1963, 1966, and 1971.

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Standard for
Dip Tanks
Containing Flammable or Combustible Liquids

NFPA No. 34 — 1974

Chapter 1 Scope and Definitions

1-1 Scope.

1-1.1 This standard applies to operations in which articles or materials are passed through contents of tanks, vats or containers of flammable liquids or combustible liquids, including coating, finishing, treating and similar processes.

1-1.2 This standard outlines practical requirements to obtain reasonable safety under average contemplated conditions. Where unusual industrial processes are involved, the authority having jurisdiction may for substantiated cause require additional safeguards or modify the requirements of this standard so that equivalent safety is thereby obtained.

1-1.3 Ovens and dryers which may be used in connection with dip tanks are covered in other standards. (*See Standard for Ovens and Furnaces, NFPA No. 86A.*)

1-1.4 This standard does not apply to dip tanks containing noncombustible liquids. Certain water type finishes, however, although involving little or no hazard in the liquid state may leave highly combustible residues upon evaporation of the liquid carrier. The provisions of this standard for minimizing the hazards of combustible residue shall be followed irrespective of the characteristics of the liquid.

1-1.5 An outline of the general principles useful in determining means to reduce the fire and explosion hazards incident to dipping operations, together with a summary of the major mandatory requirements and illustrations of suggested arrangements are contained in the Appendix to this standard.

1-2 Definitions.

1-2.1 Dip Tank shall mean a tank, vat or container of flammable or combustible liquid in which articles or materials are immersed for the purpose of coating, finishing, treating or similar processes.

1-2.2 Flammable liquid shall mean any liquid having a flash point below 100°F. (37.8°C.) and having a vapor pressure not exceeding 40 pounds per square inch absolute (2068.6mm) at 100°F. (37.8°C.).

1-2.3 Combustible liquid shall mean any liquid having a flash point at or above 100°F. (37.8°C.). For further classification, see *Basic Classification of Flammable and Combustible Liquids — NFPA No. 321.*

1-2.4 Vapor Area shall mean any area containing dangerous quantities of flammable vapors in the vicinity of dip tanks, their drain boards or associated drying, conveying or other equipment, during operation or shut-down periods. The authority having jurisdiction may determine the extent of the vapor area, taking into consideration the characteristics of the liquid, the degree of sustained ventilation, and the nature of the operations. (*See Chapter. 3.*)

1-2.4.1 A vapor area is created by the exposed surface of a liquid when the temperature of the liquid is equal to or above its flash point. Hence a liquid with a flash point of 100 degrees F. (closed cup) may create a vapor area without the application of heat when used in a very warm atmosphere. When heat is applied to a liquid, automatic arrangements to properly limit the liquid temperature will assist in preventing the formation of a vapor area.

1-2.4.2 When unenclosed dipping operations involve highly volatile liquids or large exposed surfaces, either in an open tank or on dipped materials, the vapor area may extend to all portions of the room in which the process is located. When, however, operations are provided with adequate continuous ventilation the vapor area may extend only a limited distance. (*See Chapter 3.*)

1-2.4.3 The information in Chapter 4 and Appendix C of the *Standard for Ovens and Furnaces, NFPA No. 86A* may be of assistance in determining the adequacy of ventilation necessary to prevent the formation, or limit the extent of a vapor area, under the many variable conditions encountered in the dipping operations.

1-2.4.4 Any vapor concentration exceeding 25 percent of that required to produce a lower flammable limit mixture is considered dangerous from fire or explosion. In many cases a further reduction in vapor concentration is needed to prevent toxic effect on workmen. An approved combustible gas indicator shall be used to establish the extent of a vapor area.

1-2.5 Boiling Point shall mean the boiling point of a liquid at a

pressure of 14.7 psia (760mm). Where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, for purposes of this classification the 10 percent point of a distillation performed in accordance with the *Standard Method of Test for Distillation of Petroleum Products, ASTM D-86-62**, may be used as the boiling point of the liquid.

1-2.6 FLASH POINT of a liquid shall mean the minimum temperature at which it gives off vapor in sufficient concentration to form an ignitible mixture with air near the surface of the liquid within the vessel as specified by appropriate test procedure and apparatus as follows:

The flash point of a liquid having a viscosity less than 45 SUS at 100° F (37.8° C) and a flash point below 200° F (93.4° C), shall be determined in accordance with the *Standard Method of Test for Flash Point by the Tag Closed Tester, ASTM D-56-73.**

The flash point of a liquid having a viscosity of 45 SUS or more at 100° F (37.8° C) or a flash point of 200° F (93.4° C) or higher shall be determined in accordance with the *Standard Method of Test for Flash Point by the Pensky Martens Closed Tester, ASTM D-93-73.**

*Available from American Society for Testing and Materials, 1916 Race St., Philadelphia, Pa. 19103.

Chapter 2 Location of Processes

2-1 Dip tank operations shall not be located in buildings classified as assembly, educational, institutional, or residential, except in a room designed for the purpose, protected with an approved system of automatic sprinklers, and separated vertically and horizontally from such occupancies by noncombustible construction having not less than two hours' fire resistance rating.

2-2 Dip tanks shall not be located below surrounding grade where heavy vapors cannot drain to the outside.

2-3 Dip tank operations shall be so located that in the event of fire originating at the equipment, freedom of egress and access will not be impaired.

Chapter 3 Ventilation

3-1 Vapor areas as defined in 1-2.4 shall be limited to the smallest practical space either by a suitable enclosure or by maintaining a properly designed system of ventilation arranged in cooperation with the ventilation of surrounding areas to move air from all directions towards the vapor area origin and safely exhaust it from this area.

3-2 Ventilating systems where used shall be so arranged that the loss of adequate airflow shall automatically sound an alarm and stop any automatic dipping operations.

3-3 Equipment used in a building and the ventilation of the building shall be so designed as to limit vapor area to not more than five feet from equipment.

3-4 When a required ventilating system serves associated drying operations utilizing a heating system which may be a source of ignition, means shall be provided for preventilation before the heating system can be started; the failure of any required ventilating fan shall automatically shut down the heating system; and the installation shall otherwise conform to the *Standard for Ovens and Furnaces, NFPA No. 86A.*

Chapter 4 Construction of Dip Tanks

4-1 Dip tanks, including drain boards if provided, and their supports, shall be constructed of steel, reinforced concrete, masonry, or equivalent fire-resistant material.

Where dip tanks extend through a floor to the story below, and where the weakening of the tank supports by fire may result in the tank collapse, supports shall be of material having not less than one-hour fire resistance.

4-2 The top of a dip tank shall be not less than 6 inches above the floor of the room in which located in order to prevent water flowing from the floor into the tank and overflowing contents during fire-fighting operations.

4-3 In event of a fire in a dip tank automatic sprinkler discharge may collect in the tank and float the flaming liquid out of the tank. To avoid this occurrence one or several of the following shall be done:

(a) Drain boards shall be arranged so sprinkler discharge will not be conducted into the tank.

(b) Tanks shall be equipped with an automatically closing cover.

(c) Tanks shall be equipped with overflow pipes (*see Section 4-5*).

4-4 The level of liquid in dip tanks shall be maintained not less than six inches below the top of the tank to allow effective application of extinguishing agents in the event of fire.

4-5 Overflow Pipes.

4-5.1 Dip tanks of over 150 gallons in capacity or 10 square feet in liquid surface area, shall be equipped with a properly trapped overflow pipe leading to a safe location. The size of the overflow pipe shall be sufficient to conduct the maximum rate of flow of water expected to be collected in the dip tank from automatic sprinklers or from other sources in the event of fire.

4-5.2 Depending upon the area of the liquid surface and the length and pitch of pipe, overflow pipes for dip tanks over 150 gallons in capacity, or 10 square feet in area, shall be capable of handling the maximum delivery of dip tank liquid fill pipes, or automatic sprinkler discharge, but shall not be less than three inches in diameter.

4-5.3 Piping connections on drains and overflow lines shall be designed so as to permit ready access for inspection and cleaning of the interior.

4-5.4 Overflow pipes installed in dip tanks shall have the elevation of their liquid entry level not less than six inches below the top of the tank and shall be of such size that they will drain off the maximum delivery of dip tank liquid fill pipes, or automatic sprinkler discharge apt to flow into the tank.

4-6 Bottom Drains.

4-6.1 Unless the viscosity of the liquid at normal atmospheric temperatures makes this impractical, dip tanks over 500 gallons in liquid capacity shall be equipped with bottom drains arranged to both manually and automatically quickly drain the tank in the event of fire. Manual operation shall be from a safe accessible location. Where gravity flow is not practicable, automatic pumps shall be required.

4-6.2 Such drain shall be trapped and discharge to a closed properly vented salvage tank, or to a safe location.

4-6.3 The diamenter of bottom drain pipes shall be adequate to empty the tank within five minutes, but not less than in the following table:

500 to 750 gallons	— 3 in.
750 to 1,000 gallons	— 4 in.
1,000 to 2,500 gallons	— 5 in.
2,500 to 4,000 gallons	— 6 in.
over 4,000 gallons	— 8 in.

4-7 Salvage Tanks.

4-7.1 Where salvage tanks are employed, pumping arrangements shall be provided for the retrieval of their contents, and such tanks shall be emptied before refilling the dip tanks. Salvage tanks shall conform to the applicable provisions of the *Flammable and Combustible Liquids Code, NFPA No. 30.*

4-7.2 The capacity of salvage tanks shall be greater than the capacity of the dip tank or tanks to which they are connected.

4-8 Conveyor Systems.

4-8.1 Dip operations utilizing a conveyor system shall be so arranged that in the event of fire, the conveyor system shall automatically stop.

4-8.2 Conveyor systems shall also automatically stop if required ventilation is not in full operation. (*See also Section 3-2.*)

4-9 Heating Dip Tank Liquids.

4-9.1 When dip tank liquids are heated, either by dipping of heated articles, or by application of heat to the liquid, controls as follows shall be provided to prevent excess temperature, vapor accumulation, and possible auto ignition.

4-9.1.1 Dip tanks shall be equipped with a manual reset excess temperature control, designed to shut down the conveyor system, if any, and heating system upon reaching excess temperatures.

4-9.1.2 Heating units for liquids shall be of an approved type, and be properly controlled, serviced and maintained.

4-9.1.3 Excess temperature shall mean any temperature above which the required ventilation, specified in Section 3-1, cannot safely handle generated vapors. In no case shall this temperature exceed the boiling point, or come within 100°F., below the auto ignition temperature of the liquid as determined by the *Test for Autoignition Temperature of Liquid Petroleum Products, ASTM D-2155-69.*

4-9.1.4 If there is no possibility of the liquid temperature exceeding its boiling point, or coming within 100°F. of its auto ignition temperature, then controls as specified in this Section 4-9 above are not required.

4-9.1.5 Parts shall not be dipped if their surface temperature is within 100°F. below the auto ignition temperature of the dip tank liquid. This provision does not apply to hardening and tempering tanks.

Chapter 5

Storage and Handling Liquids Used in Dip Tanks

5-1 The storage and handling of flammable and combustible liquids in connection with dipping operations shall conform to the requirements of the *Flammable and Combustible Liquids Code, NFPA No. 30,* where applicable.

5-2 The use of approved, properly grounded, closed pumping systems for the supply and removal of flammable and combustible liquids in connection with dip tanks is safer than the handling of such liquids in portable containers. Where portable containers are used for the replenishment of flammable liquids, the tank and the container shall be electrically bonded to prevent static sparks. *Static Electricity, NFPA No. 77,* provides information on static protection.

Chapter 6 Electrical and Other Sources of Ignition

6-1 There shall be no open flames, spark producing devices, or heated surfaces having a temperature sufficient to ignite vapors in any area as defined in Section 6-2.

6-1.1 When maintenance operations involve the use of welding, burning or grinding equipment, such operations shall be done under the supervision of properly designated personnel with adequate fire extinguishing equipment.

6-2 Except as specifically permitted in Section 9-3, relating to electrostatic apparatus, or where suitably separated by tight partitions, electrical installations shall conform to the requirements of Hazardous Location in the *National Electrical Code, NFPA No. 70,* as follows:

6-2.1 Pits below the floor within 20 feet horizontally of the vapor source shall be classed as Class I, Division 1.

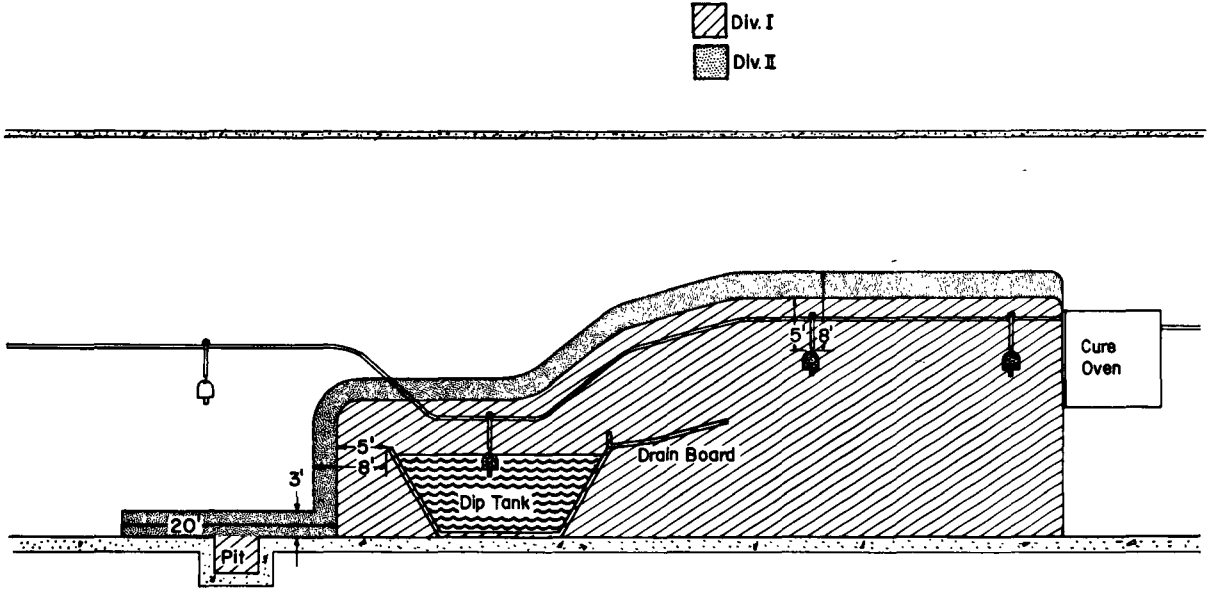
6-2.2 From the vapor source, a radial distance of five feet shall be classed as Class I, Division 1.

6-2.3 From the vapor source the space between five feet radial distance and eight feet radial distance shall be classed as Class I, Division 2. The vapor source shall be considered to extend from the liquid surface or wetted surface to the floor.

6-2.4 Horizontally from the vapor source for a radial distance 20 feet and vertically for three feet above the floor to the floor shall be classed as Class I, Division 2.

6-3 The presence of ordinary infrared drying lamps is prohibited in any vapor area, (as defined in 1-2.4); however, their use is permitted when adequate ventilation, conforming to Section 3-1 is maintained in such a manner that their location is not within the vapor area.

6-4 Unless specifically approved for locations containing both deposits of readily ignitable residues and explosive vapors, there shall be no electrical equipment in the vicinity of dip tanks, or associated drain boards or drying operations, which are subject to splashing or dripping of dip tank liquids. However, wiring in rigid conduit or in threaded boxes or fittings containing no taps, splices or terminal connection is permitted.



The extent of Class I Div 1 and Class I Div 2 hazardous locations for a paint dipping operation.

Figure 6-1

Chapter 7 Operations and Maintenance

7-1 Areas in vicinity of dip tanks shall be kept as clear of combustible material as practical and shall be kept as free as practical of combustible debris.

7-2 When waste or rags are used in connection with dipping operations, approved metal waste cans shall be provided and all impregnated rags or waste deposited therein immediately after use. The contents of waste cans shall be properly disposed of at the end of each shift.

7-3 Periodic inspections or tests shall be made of all dip-tank facilities, including covers, overflow pipe inlets and outlets, and discharge, bottom drains and valves, electrical wiring and equipment and grounding and bonding connections, ventilating facilities, and all extinguishing equipment. Any defects found shall be promptly corrected. Inspections shall be conducted at least monthly.

7-4 "No Smoking" signs in large letters on contrasting color background shall be conspicuously posted in the vicinity of dip tanks.

Chapter 8 Protection

8-1 Except as noted in Chapter 9, applying to hardening and tempering tanks, all dip tanks exceeding 150 gallon liquid capacity, or having a liquid surface area exceeding four square feet, shall be protected with at least one of the automatic extinguishing facilities conforming to 8-1.1, 8-1.2, 8-1.3, 8-1.4 or 8-1.5 of this standard.

8-1.1 Automatic Water Spray Extinguishing Systems where installed shall conform to the *Standard for Water Spray Fixed Systems for Fire Protection, NFPA No. 15,* and shall be arranged to protect tanks, drain boards and dipped articles over the drain boards.

8-1.2 Automatic Foam Extinguishing Systems where installed shall conform to the *Standard for Foam Extinguishing Systems, NFPA No. 11.* Foam-producing material selected shall be suitable for intended use, taking into account characteristics of the dip tank, of the dip-tank liquid, and its effect on the foam formation, and its possibility of producing boil over frothing. When dip tank contents include wetting agents, foam protection may be ineffective.

8-1.3 Automatic carbon dioxide systems where installed shall conform to the *Standard for Carbon Dioxide Extinguishing Systems, NFPA No. 12,* and shall be arranged to protect both dip tanks and drain boards and unless articles over drain boards are otherwise protected with extinguishing systems or facilities, the system shall also be arranged to protect such articles.

8-1.4 Automatic Dry Chemical Extinguishing Systems where installed shall conform to the *Standard for Dry Chemical Extinguishing Systems, NFPA No. 17,* and shall be arranged to protect both dip tanks and drain boards. Unless articles over drain boards are otherwise protected with extinguishing facilities, the system shall also be arranged to protect such articles.

8-1.5 Dip Tank Covers where installed shall be arranged to close automatically in the event of fire and shall be actuated by approved automatic devices and shall also be arranged for manual operation.

8-1.5.1 Covers shall be of substantial noncombustible material or of tin-clad type with enclosing metal applied with locked joints. Covers shall overlap the sides of the tank at least 1 inch and preferably have a recess or flange extending downward around the tank when it is closed.

8-1.5.2 Chains or wire ropes shall be used for cover support or operating mechanism where the burning of a cord would interfere with the action of a device. Combustible cord may be used elsewhere. All pulleys, catches and other such fasteners shall be of metal and where possible, attached to noncombustible mountings.

8-1.5.3 Where drain boards return drippings to tanks, special means shall be provided to permit the cover to close tightly and prevent water from sprinklers or other sources draining into dip tanks in the event of fire. (*See Section 4-3.*)

8-1-5.4 Covers shall be kept closed when tanks are not in use.

8-2 Areas in the vicinity of dip tanks shall be provided with portable fire extinguishers suitable for flammable and combustible liquid fires, conforming to the *Standard for Portable Fire Extinguishers, NFPA No. 10.*

Chapter 9 Special Dip Tank Applications

9-1 Hardening and Tempering Tanks.

9-1.1 The heat treatment of metals may involve their cooling by immersion in combustible liquids. Localized overheating of the surface of the liquid at the point of the immersion or heating of the entire contents of a tank above its flashpoint can result in serious fire. The heated parts shall be transferred into the oil rapidly and with a continuous motion so that this localized overheating of the liquid surface will not occur. Except as modified in this chapter and except for Chapters 3 and 6, all of the preceding chapters are applicable. (*See Standard for Industrial Furnaces Using a Special Processing Atmosphere, NFPA No. 86C.*)

9-1.2 Tanks shall be located as far as practicable from furnaces and shall not be located on or near combustible floors. Combustible stock and other combustible materials shall not be stored in the vicinity of dipping operations.

9-1.3 Tanks shall be provided with a noncombustible hood and vent or other equally effective means, to facilitate removal of vapors from the process and to prevent condensate from forming on roof structures. All such vent ducts shall be treated as flues and be kept well away from combustible roofs or materials. Hoods and ducts shall be protected with an approved automatic extinguishing system and shall be so located as to not interfere with fire protection facilities for the dip tank.

9-1.4 Tanks shall be so designed that the maximum work load is incapable of raising the temperature of the cooling medium to within 50 degrees below its flashpoint.

9-1.5 Tanks shall be equipped with a high temperature limit switch arranged to sound an alarm when the temperature of the quenching medium reaches within 50 degrees F. below the ignition temperature. If practical from an operating standpoint, such limit switches shall also shut down conveying equipment supplying work to the tank.

9-1.6 The provisions of Section 8-1 shall apply to tanks having a liquid surface area of 25 square feet or more or a capacity of 500 gallons or more.

9-1.7 Air under pressure shall not be used to fill or to agitate oil in tanks.

9-1.8 Drain facilities from bottom of tank may be combined with the oil circulating system or arranged independently to drain

the oil to a safe location. Unless the viscosity of the liquid at normal atmospheric temperatures makes this impractical, tanks over 500 gallons in liquid capacity shall be equipped with bottom drains arranged to drain quickly both manually and automatically the tank in the event of fire. Manual operation shall be from a safely accessible location. Where gravity flow is not practicable, automatic pumps shall be required. Such drain facilities shall be trapped and discharge to a closed, properly vented salvage tank or to a safe location outside. The provisions of this section do not apply to integral quench furnaces which are covered in *Industrial Furnaces Using a Special Processing Atmosphere, NFPA No. 86C.*

9-2 Flow Coating and Curtain Coating.

9-2.1 Except as modified in this Chapter, all of the preceding provision for dip tanks apply.

9-2.2 All coating operations shall be within metal, steel, reinforced concrete or masonry enclosures effective to confine coating materials and permit ventilation of the area.

9-2.3 All piping shall be strongly erected and rigidly supported.

9-2.4 Coating shall be supplied by direct low pressure pumps arranged to be automatically shut down in case of fire, or paint may be supplied by a gravity tank not exceeding 10 gallons in capacity.

9-2.5 The area of the sump and any areas on which paint flows shall be considered the "dip-tank area" for the purpose of interpreting this standard.

9-2.6 All electrically conductive elements shall be bonded together and connected to ground.

9-3 Electrostatic Apparatus.

9-3.1 Electrostatic detearing equipment shall conform to Chapters 1 through 8 of this standard (except as hereinafter modified), and shall also conform to the requirements of this chapter.

9-3.2 Electrostatic apparatus and devices used in connection with paint detearing operations shall be of approved types.

9-3.3 Transformers, power packs, control apparatus, and all other electrical portions of the equipment, with the exception of high voltage grids and their connections, shall be located outside

the vapor area defined in Chapter 1 or shall conform to the requirements of Chapter 6.

9-3.4 Electrodes shall be of substantial construction, shall be rigidly supported in permanent locations and shall be effectively insulated from ground. Insulators shall be nonporous.

9-3.5 High voltage leads to electrodes shall be effectively and permanently supported on suitable insulators, and shall be effectively guarded against accidental contact or grounding. An automatic means shall be provided for grounding and discharging any accumulated residual charge on the electrode assembly or the secondary circuit of the high voltage transformer when the transformer primary is disconnected from the source of supply.

9-3.6 A safe distance shall be maintained between goods being deteared and electrodes or conductors of at least twice the sparking distance. A suitable sign indicating this safe distance shall be conspicuously posted near the assembly.

9-3.7 Goods being deteared using this process are to be supported on conveyors. The conveyors shall be so arranged as to maintain safe distance between the goods and the electrodes at all times. All goods shall be so supported as to prevent any swinging or movement which would reduce the clearance to less than specified in 9-3.6.

9-3.8 This process shall not be used where goods being deteared are manipulated by hand. Special approval must be obtained for such operations, when acceptable to the authority having jurisdiction.

9-3.9 Electrostatic apparatus shall be equipped with automatic means which will rapidly de-energize the high voltage elements and signal the operator under any of the following conditions:

(a) Stoppage of ventilating fans or failure of ventilating equipment from any cause.

(b) Stoppage of the conveyor carrying goods through the high voltage field.

(c) Occurrence of a ground or excessive current leakage at any point on the high voltage system.

(d) Reduction of clearance below that specified in 9-3.6.

9-4 Safeguards such as adequate booths, fencing, railings, or other means shall be so placed about the equipment or incorporated therein that they, either by their location or character or both, assure that a safe isolation of the process is maintained from plant

storage or personnel. If mechanical guards are used, such guards shall be at least five feet from processing equipment.

9-5 Signs designating the process zone as dangerous as regards fire and accident shall be conspicuously posted.

9-6 All insulators shall be kept clean and dry.

9-7 Detearing area shall be ventilated by exhausting adequate air from the area as specified in Chapter 3.

9-8 All areas for detearing shall be protected by automatic sprinklers where this protection is available. Where this protection is not available, other approved automatic extinguishing equipment shall be provided.

9-9 Drip plates and screens subject to paint deposits shall be removable and shall be taken to a safe place for cleaning.

9-10 Roll Coating.

9-10.1 The processes of roll coating, spreading and impregnating in which fabrics, paper or other materials are passed directly through a tank or trough containing flammable or combustible liquids, or in contact with the surface of a roller that is coated with a flammable liquid, shall conform to the applicable requirements of Chapters 1 through 8 and in addition shall conform to 9-10.2 and 9-10.3.

9-10.2 Adequate arrangements shall be made to prevent sparks from static electricity by electrically bonding and grounding all metallic rotating and other parts of machinery and equipment and by the installation of static collectors or maintaining a conductive atmosphere such as a high relative humidity. For suggestions to minimize the hazard of static electricity, see the *Recommended Practice on Static Electricity, NFPA No. 77.*

9-10.3 Where large quantities of material are involved which have been freshly coated, using flammable liquids, the entire operation shall be located in an area well separated from other occupancies by detachment or fire walls and the entire area provided with suitable automatic protection.

9-11 Other Dip Tank Applications.

9-11.1 Other dip-tank type operations not specifically discussed in this standard, but which generally involve the application of flammable or combustible liquids shall conform to the applicable sections of this standard.

Appendix A General Principles

A-1 The operations of dipping articles or materials by passing them through flammable or combustible liquid in tanks or vats usually involves hazards of fire or explosion. These hazards vary in intensity with the character and quantity of the combustible materials involved and with the manner in which the operations are conducted. The severity of the hazard depends greatly on the character and flammability of liquids and solvents employed and the articles or materials processed; on the quantities present and on the rate of evaporation, but even with small quantities the hazard is intense if highly flammable materials are employed. Operations involving the use of low flash-point solvents are especially hazardous; however, the use of high flash-point liquids at elevated temperatures may create equivalent hazards.

A-2 The requirements of this standard are based on the premise that the dangers of fire or explosion involved in operations of this nature may include the following:

A-2.1 The readiness of ignition and possibly explosive combustion of flammable vapors evolved from the liquid surface, from the surface of freshly coated articles or material, or from surfaces of drain or drip boards.

A-2.1.2 The intensity and persistence of burning of flammable or combustible liquids with the heavy generation of smoke.

A-2.1.3 The spread of damage to adjacent areas and materials from flowing burning liquids because of container rupture, boil-over or overflow.

Most flammable and combustible liquids if lighter than water will float on a water surface and during fire-fighting operations water applied to a flammable or combustible liquid of this type in a dip tank may cause an overflow and result in floating burning liquid extending to remote locations.

A-3 The dangers involved in these operations may be reduced by the following provisions:

A-3.1 The use of fire-resistant forms of construction, automatic fire protection, and the separation of the operation from other operations, materials or occupancies by isolation, fire walls, fire partitions, or curtain boards.

A-3.2 The safe removal or dissipation of flammable vapors and the prevention of their contact with sources of ignition such as open flames, welding and cutting operations, or hot material or static or other electrical sparks.

A-3.3 The provisions of quick acting devices for the smothering of fire on liquid surfaces and for the application of extinguishing agents on freshly coated articles or materials and drain boards together with provision for the safe confinement of overflow of flammable or combustible liquids.

A-3.4 The use of quick acting bottom drain facilities for removal of contents of dip tanks to a safe location, thus reducing intensity and duration of fire.

A-3.5 The education of personnel in proper operational procedures for both normal and emergency conditions and the adequate maintenance of equipment by frequent inspections, cleaning and testing.

A-4 The size of liquid overflow pipes for dip tanks is determined by the area apt to accumulate sprinkler water and the length and pitch of the drain pipe. Suggested sizes for various accumulating areas are:

Diameter (inches)	Area (square feet)
3	up to 75
4	up to 150
5	up to 225
6	up to 325
8	325 or more

Appendix B Major Mandatory Requirements

Because of the almost limitless variety of arrangements of industrial processes utilizing dip tanks, the foregoing standard is largely devoted to provisions which emphasize the fundamental principles of inherent hazards and their safeguards. In order to assist in the application of this standard, the major mandatory requirements based on type of liquid and size of dip tank are summarized below:

(a) Mechanical ventilation to be provided. (*See Chapter 3.*)

(b) Open flames, spark producing devices and heated surfaces to be prohibited in any area containing flammable vapor-air mixtures. (*See Chapter 6.*)

(c) Dip tanks not to be located below surrounding grade where heavy vapors cannot flow to the outside. (*See Section 2-2.*)

Size of Dip Tanks (utilizing flammable or combustible liquids, irrespective of flashpoint):

(a) Over 150 gallons in capacity or having a liquid surface area over 10 square feet (*see Section 4-5*) to be provided with overflow pipes except as modified by 9-1.6.

Over 150 gallons capacity or having a liquid surface area over four square feet to be provided with automatic extinguishing facilities. (*See Section 8-2.*)

(b) Over 500 gallons capacity, to be provided with bottom drains, unless viscosity of liquid at normal atmospheric temperature makes this requirement impractical. (*See Section 4-6 and 9-1.8*).