NFPA No.

34

DIP TANKS 1966

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Official NFPA Definitions

Adopted Jan. 23, 1964. Where variances to these definitions are found, efforts to eliminate such conflicts are in process.

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AUTHORITY HAVING JURISDICTION: The organization, office or individual responsible for "approving" equipment, an installation, or a procedure.

Units of Measurements

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. One pound = 453.6 grams.

Standard for
Dip Tanks
Containing Flammable or Combustible Liquids

NFPA No. 34 — 1966

1966 Edition of No. 34

This 1966 edition was adopted by the NFPA in Annual Meeting, May 16-20, on recommendation of the Committee on Finishing Processes to supersede all previous editions.

Amendments adopted in 1966 include the following: Editorial changes were made in the Scope and in Sections 501, 811, 951, A.2 and A.3. Amendments were made in Sections 102, 408(a), 408(b), 410(a), B.2 and B.3.

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 Subsequently jurisdiction was transferred to a new Committee on Manufacturing Hazards which in turn was superseded by the present Committee on Finishing Processes.

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-

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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, and 1963. Official record of Association action on the several editions will be found in the NFPA Proceedings.

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Standard for

Dip Tanks

Containing Flammable or Combustible Liquids

NFPA No. 34 — 1966

Scope.

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

2. This Standard outlines practical minimum requirements to obtain reasonable safety under average contemplated conditions. Where special industrial processes such as saturating machines for roofing felt, etc., are involved, the authority having jurisdiction may modify this Standard or require additional safeguards in accordance with the principles on which this Standard is based.

3. Ovens and dryers which may be used in connection with dip tanks are covered in other Standards (see NFPA Standard for Ovens and Furnaces, NFPA No. 86A).

4. This Standard does not apply to dip tanks containing noncombustible liquids.

5. For suggested safeguards of salt baths for heat treatment of metals see Research Report No. 2 (1946) of the American Insurance Association.*

NOTE: 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.

* Available from the American Insurance Association, 85 John St., New York, N. Y. 10038.

Chapter 1.

DEFINITIONS.

101. DIP TANK—For the purpose of this Standard a "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.

102. LIQUIDS—Flammable liquid shall mean any liquid having a flash point below 140° F. (60° C.) closed cup and having a vapor pressure not exceeding 40 pounds per square inch absolute (2068.6 mm) at 100° F. (37.8° C.). Combustible liquid shall mean any liquid having a flash point at or above 140° F. (60° C.). For further classification see Basic Classification of Flammable and Combustible Liquids—NFPA No. 321.

103. VAPOR AREA—For the purpose of this Standard a "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.

NOTE 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 flashpoint. Hence a liquid with a flashpoint of 110 degrees F. (closed cup) may create a vapor area without the application of artificial heat when used in a very warm atmosphere. When artificial heat is applied to a liquid having a flashpoint well above the maximum contemplated atmospheric temperature, automatic arrangements to properly limit the liquid temperature will assist in preventing the formation of a vapor area.

NOTE 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.

NOTE 3. The information in Chapter 4 and Appendix C of NFPA 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 dipping operations.

NOTE 4. A controlled vapor concentration not exceeding 25% of that required to produce a lower explosive limit mixture may be considered as not dangerous from fire or explosion. In many cases a further reduction in vapor concentration is needed to prevent toxic effect on workmen. Where conditions of the rate of vapor-air movement are not subject to change, approved vapor testing equipment may be of assistance in establishing the extent of a vapor area.

Chapter 2.

LOCATION OF PROCESSES.

201. Dip tank operations should preferably be located in detached one-story buildings of fire-resistive construction, protected by an approved system of automatic sprinklers.

202. 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 by an approved system of automatic sprinklers and separated vertically and horizontally from other occupancies by construction having at least two hours fire resistance rating.

203. In industrial and similar buildings, dip tank operations, if not in a detached building, should be separated from other important occupancies by construction having at least two hours fire resistance rating.

204. Because of the possible accumulation of flammable vapors, dip tanks should not be located in basements.

205. The floor of dip tank processing areas should be so waterproofed, curbed and drained to a point of safe discharge as to safeguard property below or in the vicinity against damage by overflow of flammable liquids or by water, in the event of fire.

206. Dip tank operations should 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.

301. Vapor areas as defined in Section 103 shall be limited to the smallest practical space by maintaining a properly designed system of mechanical ventilation arranged to move air from all directions towards the vapor area origin and thence to a safe outside location. Ventilating systems shall conform to NFPA Standards for Blower and Exhaust Systems (NFPA Pamphlet No. 91).

NOTE 1. The proper design of a ventilating system may involve a separate engineering problem for each installation. Although the characteristics of liquids used in dip tank operations differ widely, most vapors from volatile liquids in use are heavier than air and, without controlled ventilation, may form explosive air-vapor strata at locations remote from the liquid of their origin. In order to properly ventilate a room containing dipping operations, all portions of the enclosure must be considered and air inlets as well as air outlets to the enclosure must be controlled as to location and capacity.

NOTE 2. When drying dipped articles or materials, it is practical to maintain sufficient air velocity over their surface to keep the surrounding atmosphere below the explosive range of the evaporating solvent.

302. Required ventilating systems shall be so arranged that the failure of any ventilating fan shall automatically stop any dipping conveyor system. (See also Section 409.)

303. 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 pre-ventilation before heating system can be started; the failure of any ventilating fan shall automatically shut down the heating system; and the installation shall otherwise conform to NFPA Standard for Ovens and Furnaces (NFPA No. 86A).

Chapter 4.

CONSTRUCTION OF DIP TANKS.

401. Dip tanks, including drain boards if provided, shall be constructed of substantial noncombustible material, and their supports shall be of heavy metal, reinforced concrete or masonry. Where dip tanks extend through a floor to the story below or where the weakening of the tank supports by fire may result in the tank collapse, supports should be of material having not less than one-hour fire resistance.

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

403. If drain boards drain into dip tank they should be arranged to automatically prevent conducting water into dip tank in the event of fire. (See also Appendix C.)

404. Liquid level of dip tanks should be maintained not less than 6 inches below top of tanks to allow effective application of extinguishing agents in event of fire.

405. Overflow Pipes.

(a). 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 outside buildings. Smaller dip tanks should also be so equipped, where practical. The discharge of the overflow pipe should be so located and arranged that if the entire combustible contents of dip tank is overflowed through overflow pipe by the application of water during fire fighting, property will not be endangered. The size of the overflow pipe should be sufficient to conduct the maximum rate of flow of water expected to be applied to the liquid surface of the dip tank from automatic sprinklers or from other sources in the event of fire.

(b). Overflow pipes shall be of sufficient capacity to overflow the maximum delivery of dip tank liquid fill pipes but shall not be less than 3 inches in diameter and shall be increased in size depending upon the area of the liquid surface and the length and pitch of pipe.

(c). If the liquid surface area of dip tank (and drain board, unless drain board is arranged to positively prevent drainage into dip tank) is 75-150 square feet, diameter of overflow pipe should be not less than 4 inches; if 150-225 square feet, not less than 5 inches; if 225-325 square feet, not less than 6 inches.

(d). On large dip tanks, multiple overflow connections are preferable to a single large pipe, provided the aggregate cross sectional area is equivalent.

(e). Overflow pipes should be connected to dip tanks through a flared outlet where the accumulation of caked or dried material may clog the overflow opening.

(f). Piping connections on drains and overflow lines shall be designed so as to permit ready access for inspection and cleaning of interior.

(g). The bottom of the overflow connection shall be not less than 6 inches below the top of the tank. (See also Sections 404 and 833.)

406. Bottom Drains.

(a). Dip tanks over 500 gallons in liquid capacity shall be equipped with bottom drains automatically and manually arranged to quickly drain tank in event of fire, unless the viscosity of the liquid at normal atmospheric temperature makes this impractical. Manual operation shall be from a safely accessible location. Where gravity flow is not practicable, automatic pumps shall be required.

(b). Such drain shall be trapped and discharge to a closed properly vented salvage tank or to a safe location outside which will not endanger property.

(c). According to tank capacity the diameter of bottom drain pipe shall be not less than the following:

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.

(d). Where the drain line is long or of poor pitch the pipe size should be increased.

407. Salvage Tanks.

(a). Where salvage tanks are employed, pumping arrangements should be provided for the transfer of their contents; salvage tanks should not be used for storage.

(b). The capacity of salvage tank shall be greater than the capacity of the dip tank or tanks to which they are connected.

(c). Salvage tanks should preferably be located outside underground; however, subject to approval of the authority having jurisdiction they may be located inside.

408. Automatic Extinguishing Facilities.

(a). Except as noted in Section 916 (applying to hardening and tempering tanks), all dip tanks exceeding 150 gallons liquid capacity or having a liquid surface area exceeding 4 square feet shall be protected with at least one of the automatic extinguishing facilities conforming to Sections 820, 830, 840, 850 or 860 of this standard.

(b). It is desirable that all dip tanks, irrespective of size or type of combustible or flammable liquid also conform to Section 408(a), where practical. It is especially recommended that dip tanks containing low flash point flammable liquids be equipped with covers kept closed when tank is not in actual use.

409. Conveyor Systems.

(a). Dip tanks utilizing a conveyor system shall be so arranged that in the event of fire, the conveyor system shall automatically cease motion and required bottom drains shall open. Conveyor systems shall automatically cease motion unless required ventilation is in full operation. (See also Section 302.)

410. Heating Dip Tank Liquids.

(a). When dip tank liquids are artificially heated, either by the dipping of heated articles, or by other application of heat to the liquid, provision shall be made to prevent a temperature rise greater than 50 degrees F. below the flash point of the liquid. (See also Section 910 pertaining to hardening and tempering tanks.)

Chapter 5.

LIQUIDS USED IN DIP TANKS, STORAGE AND HANDLING.

501. The storage of flammable and combustible liquids in connection with dipping operation shall conform to the requirements of the Flammable and Combustible Liquids Code, NFPA No. 30, where applicable.

502. The safeguards provided for the storage and handling of dip tank liquids having a flash point (closed cup) of 200 degrees F. or higher should, where practicable, also conform to Section 501 of this Standard.

503. 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 considered safer than the handling of such liquids in portable containers. Where portable containers are used for the replenishment of flammable and combustible liquids, provision shall be made so that both the container and tank shall be positively grounded and electrically bonded to prevent static electric sparks.

504. Storage of full or empty containers within process buildings should not extend the requirements for one operating shift.

Chapter 6.

ELECTRICAL AND OTHER SOURCES OF IGNITION.

601. There shall be no open flames, spark producing devices, or heated surfaces having a temperature sufficient to ignite vapors in any vapor area, as defined by Section 103.

602. Except as specifically permitted in Section 930, relating to electrostatic apparatus, electrical wiring and equipment in any vapor area (as defined by Section 103) shall be explosion proof type approved for Class I, Group D locations and shall otherwise conform to the provisions of the National Electrical Code (NFPA No. 70), Article 500, Class I, Division 1.

NOTE: It will be observed that the presence of ordinary infra-red drying lamps is prohibited in any vapor area (as defined by Section 103); however, their use is permitted when adequate ventilation, conforming to Section 303 is maintained in such manner that their location is not within the vapor area.

603. 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, except wiring in rigid conduit or in threaded boxes or fittings containing no taps, splices or terminal connections, and except as hereinafter specifically permitted in Section 930, relating to electrostatic apparatus.

604. In any floor space outside a vapor area (as defined by Section 103) but within 20 feet therefrom, and not separated by tight partitions, there shall be no open flames or spark producing devices [except as specifically permitted in NFPA Standard No. 86A, Ovens and Furnaces (Paragraph 200-7)] and electrical wiring and equipment shall conform to the provisions of the National Electrical Code (NFPA No. 70), Article 500, Class I, Division 2.

NOTE: The distance of 20 feet specified in Section 604 should be increased when abnormal conditions such as the failure of a ventilating system would be likely to spread the vapor area.

Chapter 7.

OPERATIONS AND MAINTENANCE.

701. Areas in vicinity of dip tanks shall be kept as clear of combustible stock as practical and shall be kept entirely free of combustible debris.

702. 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 least once daily at the end of each shift.

703. Periodic inspection or tests of all dip tank facilities shall be made, including covers, overflow pipe inlets and discharge,

bottom drains and valves, electrical wiring and equipment and grounding connections, ventilating facilities, and all extinguishing equipment. Any defects found shall be promptly corrected.

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

705. Conspicuous signs should be posted in the vicinity of dipping operations conveying the following warning:

> **NO WELDING**
> The use of welding or cutting equipment in, or near this area is dangerous because of fire and explosion. Welding and cutting shall be done only under the supervision of the foreman in charge.

Chapter 8.

EXTINGUISHMENT.

810. Extinguishers.

811. Areas in the vicinity of dip tanks shall be provided with manual fire extinguishers suitable for flammable and combustible liquid fires, conforming to Standard for Portable Fire Extinguishers (NFPA No. 10).

820. Automatic Water Spray Extinguishing Systems.

821. Such systems shall conform to NFPA Standard for Water Spray Systems for Fire Protection (NFPA No. 15) and shall be arranged to protect tanks, drain boards and stock over drain boards.

830. Automatic Foam Extinguishing Systems.

831. Such systems shall conform to NFPA Standard for Foam Extinguishing Systems (NFPA No. 11) and shall also conform to the following:

832. Foam producing material selected shall be suitable for intended use, taking into account characteristics of the dip tank liquid. Alcohol, ether or ester solvents may require "alcohol type" foams. When dip tank contents include wetting agents, foam protection may be ineffective.

833. Overflow pipe shall be arranged to prevent the floating away of foam and clogging overflow pipe. This may be accomplished by either of the following:

(a) Overflow pipe may be extended through tank wall and terminated in an ell pointing downward. The bottom of the overflow pipe at the point it pierces tank wall should not be over two inches above the opening or face of the ell.

(b) Overflow pipe inlet may be provided with a removable screen of one-fourth inch mesh having an area at least twice the cross-sectional area of overflow pipe. Screens which may be clogged by dip tank ingredients shall be inspected and cleaned periodically.

834. Where the characteristics of the foam are such that it will not readily flow into corners of rectangular dip tanks, such tanks should be provided with rounded corners, except where a sufficient number of discharge outlets are provided to deliver foam into corners or where foam is distributed by overhead spray heads with spray pattern including full tank area, or, except where foam quantities delivered are greatly in excess of minimum requirements for the area.

835. Where dip tank contents are artificially heated to temperatures above 100 degrees F., increased foam delivery rates and total foam quantities may be required. Where dip tank contents are at temperatures above 212 degrees F., a boilover hazard may be created by foam system protection, especially if there is the possibility of a slug of water or unreacted foam ingredients entering the tank. When boilover is likely to occur, the area surrounding the tank should also be protected.

840. Automatic Carbon Dioxide Systems.

841. Such systems shall conform to NFPA Standard for Carbon Dioxide Extinguishing Systems (NFPA No. 12) and shall be arranged to protect both dip tanks and drain boards and unless stock over drain boards is otherwise protected with automatic extinguishing facilities, shall also be arranged to protect such stock.

850. Dry Chemical Extinguishing Systems.

851. Dry chemical extinguishing systems shall conform to NFPA Standard for Dry Chemical Extinguishing Systems

(NFPA No. 17) and shall be arranged to protect both dip tanks and drain boards, and unless stock over drain boards is otherwise protected with automatic extinguishing facilities, shall also be arranged to protect such stock.

860. Dip Tank Covers.

861. Covers arranged to close automatically in the event of fire shall be actuated by approved automatic devices and shall also be arranged for manual operation.

862. Covers shall be of substantial noncombustible material or of tin-clad type with enclosing metal applied with locked joints. Covers should 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. The cover should be securely but loosely hung on hinges or guides, due provision being made for the possible accumulation of obstructions on the moving parts. Large heavy covers should be provided with counter weights where necessary to prevent injury to employees.

863. Chains or wire rope 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 should be of metal and where possible, attached to noncombustible mountings.

864. Where drain boards return drippings to tanks, special means should be provided to permit the cover to close tightly and prevent water from sprinklers or other sources draining into dip tank in the event of fire. (Also see Section 403.)

865. Covers shall be kept closed when tanks are not in use.

NOTE: See also Appendix C for suggested arrangements of dip tank covers.

Chapter 9.

SPECIAL DIP TANK APPLICATIONS.

910. Hardening and Tempering Tanks.

NOTE: The heat treatment of metals may involve their cooling by immersion in combustible liquids. Localized overheating of the surface of the liquid at the time of immersion or the heating of the entire contents of a tank to its flashpoint can result in serious fire.

911. Except as modified in this Chapter and except for Chapters 3 and 6, all of the preceding Chapters are applicable.

912. 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 should not be stored in the vicinity of dipping operations.

913. Tanks shall be provided with a noncombustible hood and vent or other equally effective means, venting to outside of building to serve as a vent in case of fire. All such vent ducts shall be treated as flues and be kept well away from combustible roofs or materials. To facilitate removal of vapors from the process and to prevent condensate forming on roof structures, a fan of adequate capacity may be necessary. Hoods should not interfere with fire protection facilities.

914. 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, or such tanks shall be equipped with circulating cooling systems which will accomplish the same result.

915. 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 flashpoint. If practical from an operating standpoint, such limit switches shall also shut down conveying equipment supplying work to the tank.

916. The provisions of Section 408 shall apply to tanks having a liquid surface area of 25 square feet or more or a capacity of 500 gallons or more.

917. Air under pressure shall not be used to fill or to agitate oil in tanks.

918. 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. The authority having jurisdiction should be consulted as to whether the drain valve shall be operated automatically with approved heat actuated devices or manually, and if the latter, the valve shall be operated from a safe distance.

920. Flow Coat.

921. Except as modified in this Chapter, all of the preceding standards for dip tanks apply.

922. All flow coat operations should be within an effective noncombustible enclosure, adequately vented to the outside of building.

923. All piping shall be strongly erected and rigidly supported.

924. Paint shall be supplied by direct low pressure pumping arranged to automatically shut down by means of approved heat actuated devices, in case of fire, or paint may be supplied by a gravity tank not exceeding 10 gallons in capacity.

925. The area of the sump and any areas on which paint flows should be considered the area of dip tank for the purpose of interpreting this Standard.

930. Electrostatic Apparatus.

931. When installation and use of electrostatic detearing equipment is judged by the authority having jurisdiction to be permissible, such installation and use shall conform to Chapters 1 through 8 of this Standard (except hereinafter modified), and shall also conform to the requirements of this Chapter.

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

933. 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 as defined in Chapter 1 or shall conform to the requirements of Chapter 6.

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

935. 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.

936. A space shall be maintained between goods being deteared and electrodes or conductors of at least twice the sparking distance. A suitable sign stating the sparking distance shall be conspicuously posted near the assembly.

937. Goods being deteared using this process are to be supported on conveyors. The conveyors shall be so arranged as to maintain safe distances 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 Section 936.

938. This process is not approved where goods being deteared are manipulated by hand. Special approval must be obtained for such operations.

939. Electrostatic apparatus shall be equipped with automatic controls which will operate without time delay to disconnect the power supply to the high voltage transformer and to 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 past the high voltage grid.

(c). Occurrence of a ground or of an imminent ground at any point on the high voltage system.

(d). Reduction of clearance below that specified in Section 936.

940. Adequate fencing, railings or guards shall be so placed about the equipment 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. Such railings, fencing and guards shall be of conducting material, adequately grounded, and should be at least 5 feet from processing equipment.

941. Signs designating the process zone as dangerous as regards fire and accident should be posted.

942. Electrode insulators shall be kept clean and dry.

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

944. 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.

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

950. Roll Coating.

951. The processes of roll coating, spreading and impregnating, in which fabrics, paper or other material are passed directly through a tank or trough containing flammable or combustible liquids, or over the surface of a roller that revolves partially submerged in a flammable liquid, shall conform to the applicable requirements of Chapters 1 through 8 and in addition shall conform to Sections 952 and 953.

952. 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.

NOTE: For suggestions to minimize the hazard of static electricity, see NFPA Recommended Practice on Static Electricity, No. 77.

953. Where large quantities of material are involved which have been freshly coated, using low flash point solvents, the entire operation should be located in an area well separated from other occupancies by detachment or fire walls and the entire area provided with suitable automatic protection.

960. Other Dip Tank Applications.

961. Saturating operations for roofing felt and similar material and other special dip tank operations should conform to the applicable Sections of this Standard. The authority having jurisdiction should be consulted concerning the modification of this Standard or additional safeguards necessary for unusual dip tank applications.

APPENDIX A.

General Principles.

A.1 The operation 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. The greater the operations, the greater the need for secure separation and strong protective measures. Operations involving the use of low flashpoint solvents are especially hazardous; however, the use of high flashpoint 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). The readiness of ignition and possibly explosive combustion of flammable vapors evolved from the liquid surface, from the surfaces of freshly coated articles or material, or from surfaces of drain or drip boards, with the quick spread of fire.

(b). The intensity and persistence of burning of flammable or combustible liquids with the heavy generation of smoke.

(c). The spread of damage to adjacent areas and materials from flowing burning liquids because of container rupture, boilover or overflow.

Most flammable and combustible liquids being lighter than water will float on a water surface and during fire fighting operations water applied to a flammable or combustible liquid 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). The use of fire-resistant forms of construction, automatic sprinkler protection, and the separation of the operation from other operations, materials or occupancies by isolation or by fire walls, fire partitions, or curtain-boards.

(b). 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 glowing bodies, or static or other electrical sparks.

(c). The provision 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.

(d). The use of quick acting bottom drain facilities for removal of contents of dip tanks to a safe location, thus reducing the intensity and duration of fire.

(e). The education of personnel in proper operational procedures for both normal and emergency conditions and the adequate maintenance of equipment by periodic inspections, cleaning and testing.

APPENDIX B.

Major Mandatory Requirements.

B.1 Because of the almost limitless variety of arrangements of industrial processes utilizing dip tanks, the foregoing Standard is largely devoted to advisory 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 variations based on type of liquid and size of dip tank are summarized below:

B.2 Vapor Hazard: Where dip tanks utilize flammable liquids under conditions which may create a "vapor area" as herein defined:

(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 drain to outside. (See Section 203.)

B.3 Size of Dip Tank: (Utilizing flammable or combustible liquids, irrespective of flashpoint.)