

NFPA®

34

Standard for Dipping, Coating, and Printing Processes Using Flammable or Combustible Liquids

2018



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NFPA® 34

Standard for

Dipping, Coating, and Printing Processes Using Flammable or Combustible Liquids

2018 Edition

This edition of NFPA 34, *Standard for Dipping, Coating, and Printing Processes Using Flammable or Combustible Liquids*, was prepared by the Technical Committee on Finishing Processes. It was issued by the Standards Council on November 10, 2017, with an effective date of November 30, 2017, and supersedes all previous editions.

This edition of NFPA 34 was approved as an American National Standard on November 30, 2017.

Origin and Development of NFPA 34

NFPA standards on safeguarding process tanks containing flammable and combustible 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 Subsequently, jurisdiction was transferred to a new Committee on Manufacturing Hazards, which, in turn, was superseded by the current Technical Committee on Finishing Processes.

The original 1913 edition was completely revised in 1921 and 1922, at which time material on hardening and tempering tanks and flow coat work was added to the original standard.

Further revisions to keep the text up to date on various new aspects of the subject were adopted in 1922, 1926, 1936, 1940, 1946, 1952, 1957, 1959, 1963, 1966, 1971, 1974, 1979, 1982, 1987, 1989, 1995, 2000, 2003, 2006, and 2010.

The following major changes were adopted for the 2003 edition:

- (1) The scope of the standard was extended to cover water-based coatings.
- (2) The arrangement of the text was modified to comply with the *Manual of Style for NFPA Technical Committee Documents*, including the relocation of Chapter 11, Referenced Publications, to a new Chapter 2 and the addition of a new Chapter 3, Definitions, which incorporated all the definitions previously located in Chapter 1.
- (3) Chapter 6 (formerly Chapter 4), Electrical and Other Sources of Ignition, was extensively revised to recognize the Zone concept of area classification. Included in those revisions were the addition of appropriate definitions and revisions of the figures illustrating the area classifications in and around dipping and coating processes.
- (4) Subsection 7.6.1 (formerly 5.5.1) was revised to allow recirculation of exhaust air under certain conditions and to specify those conditions.
- (5) Chapter 9 (formerly Chapter 7), Protection, was revised to correlate with Chapter 9, Protection, of NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*.
- (6) Section 11.6 (formerly Section 9.6) was revised to require grounding, as well as deenergizing, of the electrostatic circuit.

The following major changes were adopted for the 2007 edition:

- (1) A number of definitions were changed to incorporate “preferred” definitions to ensure consistent meaning and use of defined terms throughout the National Fire Codes. Where “preferred” definitions cannot be used for certain terms, those terms have been delimited by the phrase “For the purposes of this standard, ...”.
- (2) New definitions were added for the terms electrostatic detearing, peripheral vapor containment, secondary enclosure, solvent cleaning, and ventilation.
- (3) Requirements for hazardous location electrical utilization equipment and wiring were further revised to correlate with *NFPA 70®*, *National Electrical Code®*, including appropriate Fine Print Notes from *NFPA 70*.
- (4) New diagrams were added to illustrate electrical area classification around open dipping and coating processes.
- (5) Quantity limitations for storing flammable and combustible liquids were changed to correlate with NFPA 30, *Flammable and Combustible Liquids Code*.
- (6) Chapter 9, Protection, was completely rewritten to accomplish the following:
 - (a) Correlate with NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*
 - (b) Add necessary requirements for interlocks for proper operation of fire protection systems
 - (c) Require fire protection systems to be designed so that operation does not result in a spill of the flammable or combustible liquid
 - (d) Require fire protection systems to discharge into the entire protected area
- (7) A section on solvent distillation units (i.e., solvent recyclers) was added.
- (8) Additional changes were made to correlate this standard with NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*.

The following major changes were adopted in the 2011 edition:

- (1) The scope of the standard was amended to specifically address printing processes, and appropriate changes were made throughout NFPA 34 where certain provisions applied specifically to the printing process or excluded printing processes.
- (2) The scope of the standard was amended to specifically include vapor degreasing processes and to specifically exclude processes that use only Class IIIB liquids.
- (3) New definitions for printing and for certain types of printing processes were added to Chapter 3.
- (4) A new paragraph, 5.2.1.1, was added to allow coating rolls to be covered with polymeric or other combustible materials.
- (5) Section 5.3, which requires the top of the coating tank to be a certain distance above the floor, was amended to apply only to tanks holding flammable or combustible liquid.
- (6) Exceptions were added to 5.9.1 and 5.9.2 to exclude sheet and web transport systems from the requirement to stop conveying systems under certain conditions.
- (7) Paragraph 5.10.1.3 was amended to prevent coating of workpieces whose surface temperature exceeds the boiling point of the coating media.
- (8) Subsection 6.2.2, which prohibits use of certain ignition-capable equipment, was amended to apply only to areas where flammable or combustible liquid is in use.
- (9) A new Figure 6.4(e) was added to illustrate the hazardous (classified) area around a printing press for purposes of electrical area classification.
- (10) Subsection 6.4.2 was amended to describe the hazardous (classified) area associated with ink tanks and reservoirs in printing processes.
- (11) Section 6.5, on electrical area classification of enclosed processes, was amended to apply only to dipping and coating processes. Printing processes are inherently open in nature.
- (12) A new subsection, 6.8.2, was added, requiring means to dissipate static electric charges from nonconductive substrates.
- (13) An exception was added to 9.5.1(4) to exclude sheet and web transport systems from the requirement to stop conveying systems under certain conditions, if stopping would cause a more hazardous situation.
- (14) A new Section 9.11 was added to address fire protection measures specific to printing processes.
- (15) Chapter 10 was amended to improve the requirements that address housekeeping, handling of liquid-impregnated rags, and waste.
- (16) Section 10.5 was completely rewritten to address use of Class I flammable liquids and Class II combustible liquids for cleaning operations.
- (17) A new Section 10.6 was added to address cleaning of combustible dusts and residues.
- (18) A new Section 10.10 was added to address solvent recovery systems.
- (19) A new annex item, A.9.3.1(3), was added to describe where carbon dioxide fire protection systems have been found useful in printing processes.

Following are some of the key changes made to the 2015 edition of NFPA 34:

- (1) Terms and definitions were modified to be consistent with other NFPA documents and to mirror those used in NFPA 33.
- (2) Requirements were established for processes located in basements to ensure adequate egress and access for emergency response personnel.
- (3) Artwork in Chapter 6 was revised for consist formatting and to better depict electrical classification requirements in the document.
- (4) The requirements for recirculation were revised to include the recirculation particulate filters, which are now defined in the standard.
- (5) The requirements for routing of exhaust ducts were clarified and modified to be consistent with NFPA 33.
- (6) The requirements for support of exhaust ducts were clarified and annex material was added.
- (7) The storage allowances for flammable and combustible liquids in Chapter 8 were modified to be consistent with NFPA 33 and NFPA 30 requirements.
- (8) Water mist fire protection systems meeting the requirements of NFPA 750 were added as an acceptable method of fire protection.

The following changes have been made for the 2018 edition:

- (1) Chapter 1, Administration, added clarification to document application. For example, Chapter 14 shall apply only to miscellaneous spray operations, and Chapter 18 shall apply only to spray application processes or operations that are conducted in temporary membrane enclosures both inside and outside buildings and structures.
- (2) Chapter 3, Definitions, was modified to be consistent with other NFPA documents. In addition, definition changes made to liquids and materials are consistent with other NFPA documents placing noncombustible material, limited combustible material, and classification of liquids and determination of flash points in a General Requirements section. Changes to definitions are consistent with NFPA 1, NFPA 30, and NFPA 5000.
- (3) Chapter 4, General Requirements, has been revised to clarify definitions and location of dipping, coating, and printing processes. Additional supporting Annex A material has been provided.
- (4) Chapter 5, Design and Construction of Dipping, Coating, and Printing Equipment and Systems, has been revised to remove the exception and clarify construction for secondary enclosures.
- (5) Chapter 6, Electrical and Other Sources of Ignition, has been revised. In addition, the figures in Chapter 6 and Annex A were revised to improve consistency and to clarify electrical classification requirements in the document.

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Committee Scope: This Committee shall have primary responsibility for documents on safeguarding against the fire and explosion hazards associated with spray application processes, dipping processes, coating processes, and other similar processes, including glass fiber/resin fabrication processes and printing processes, except for certain dipping processes that are within the scope of the Committee on Ovens and Furnaces.

Contents

Chapter 1 Administration	34- 8	7.9 Exhaust Duct Cross-Section.	34- 19
1.1 Scope.	34- 8	7.10 Exhaust Duct Access.	34- 19
1.2 Purpose.	34- 8	7.11 Exhaust Fans and Drives.	34- 19
1.3 Application.	34- 8	7.12 Drying Areas.	34- 19
1.4 Retroactivity.	34- 8		
1.5 Equivalency.	34- 8	Chapter 8 Storage, Handling, and Distribution of	
1.6 Units and Formulas.	34- 9	Flammable and Combustible Liquids	34- 19
1.7 Enforcement. (Reserved)	34- 9	8.1 Scope.	34- 19
Chapter 2 Referenced Publications	34- 9	8.2 General.	34- 19
2.1 General.	34- 9	8.3 Storage in Process Areas.	34- 19
2.2 NFPA Publications.	34- 9	8.4 Transporting Liquids.	34- 19
2.3 Other Publications.	34- 9	8.5 Handling Liquids at Point of Final Use.	34- 19
2.4 References for Extracts in Mandatory Sections. ...	34- 9	8.6 Liquid Piping Systems.	34- 20
Chapter 3 Definitions	34- 9	Chapter 9 Protection	34- 21
3.1 General.	34- 9	9.1 Scope.	34- 21
3.2 NFPA Official Definitions.	34- 10	9.2 Automatic Fire Protection Systems.	34- 21
3.3 General Definitions.	34- 10	9.3 Ventilation Systems.	34- 21
Chapter 4 General Requirements	34- 11	9.4 Notification and Interlocks.	34- 21
4.1 Location of Dipping, Coating, and Printing		9.5 Automatic Fire Protection for Small Dipping	
Processes.	34- 11	Processes.	34- 21
4.2 Separation.	34- 11	9.6 Automatic Fire Protection for Enclosed Processes	
4.3 Basements.	34- 11	and Large Processes.	34- 21
4.4 Access to Means of Egress.	34- 11	9.7 Requirements for All Fire Protection Systems.	34- 21
4.5 Noncombustible Material.	34- 11	9.8 Specific Requirements for Automatic Carbon	
4.6 Limited-Combustible Material.	34- 11	Dioxide, Dry Chemical, Clean Agent, and Water	
4.7 Classification of Liquids.	34- 11	Mist Systems.	34- 21
4.8 Determination of Flash Point.	34- 12	9.9 Specific Requirements for Water-Based Fire	
Chapter 5 Design and Construction of Dipping,		Protection Systems.	34- 22
Coating, and Printing Equipment and		9.10 Automatic Fire Protection for Printing Processes.	34- 22
Systems	34- 12	9.11 Portable Fire Extinguishers.	34- 22
5.1 Scope.	34- 12	Chapter 10 Operations and Maintenance	34- 22
5.2 General Requirements.	34- 12	10.1 Scope.	34- 22
5.3 Height Above Floor.	34- 12	10.2 General.	34- 22
5.4 Overflow Prevention.	34- 12	10.3 Waste Containers.	34- 22
5.5 Liquid Level.	34- 12	10.4 Inspection and Testing.	34- 22
5.6 Overflow Pipes.	34- 12	10.5 Cleaning Operations.	34- 22
5.7 Bottom Drains.	34- 13	10.6 Combustible Dusts and Residues.	34- 22
5.8 Salvage Tanks.	34- 13	10.7 Smoking.	34- 22
5.9 Conveyor Systems.	34- 13	10.8 Hot Work.	34- 22
5.10 Control of Liquid Temperature.	34- 13	10.9 Solvent Distillation Units (Solvent Recyclers).	34- 22
Chapter 6 Electrical and Other Sources of Ignition	34- 13	10.10 Solvent Recovery Systems.	34- 23
6.1 Scope.	34- 13	Chapter 11 Electrostatic Detearing Apparatus	34- 23
6.2 General.	34- 13	11.1 Scope.	34- 23
6.3 Electrical Area Classification — Class I		11.2 General.	34- 23
Locations.	34- 14	11.3 Requirements for Electrical System and	
6.4 Areas Adjacent to Open Processes.	34- 15	Components.	34- 23
6.5 Areas Adjacent to Enclosed Dipping and Coating		11.4 Support of Workpieces.	34- 23
Processes.	34- 15	11.5 Manual Operations.	34- 23
6.6 Equipment and Containers in Ventilated Areas. ..	34- 17	11.6 Electrical Safety Requirements.	34- 23
6.7 Luminaires.	34- 17	11.7 Personnel Safety.	34- 23
6.8 Static Electric Discharges.	34- 18	11.8 Grounding Requirements.	34- 23
Chapter 7 Ventilation	34- 18	11.9 Signs.	34- 23
7.1 Scope.	34- 18	11.10 Drip Plates and Screens.	34- 23
7.2 General.	34- 18	Chapter 12 Training	34- 23
7.3 Performance Requirements.	34- 18	12.1 General.	34- 23
7.4 Make-Up Air.	34- 18		
7.5 Routing of Exhaust Ducts.	34- 18		
7.6 Recirculation of Exhaust.	34- 18		
7.7 Materials of Construction.	34- 19		
7.8 Support of Exhaust Ducts.	34- 19		

Annex A	Explanatory Material	34– 24	Annex D	Informational References	34– 34
Annex B	Fire Record	34– 30	Index		34– 35
Annex C	Illustrations of Suggested Methods of Protection	34– 31			

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex D. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex D.

Chapter 1 Administration

1.1 Scope.

1.1.1* This standard shall apply to dipping, roll coating, flow coating, curtain coating, printing, cleaning, and similar processes, hereinafter referred to as "coating processes" or "processes," in which articles or materials are passed through tanks, vats, or containers, or passed over rollers, drums, or other process equipment that contain flammable or combustible liquids.

1.1.2 This standard shall also apply to cleaning processes that utilize a solvent vapor, such as vapor degreasing processes.

1.1.3 This standard shall also apply to processes that use water-borne, water-based, and water-reducible materials that contain

flammable or combustible liquids or that produce combustible deposits or residues.

1.1.4 This standard shall not apply to processes that use only noncombustible liquids for processing and cleaning. This standard shall also not apply to processes that use only Class IIIB liquids for processing or cleaning, provided the liquids or mixtures thereof maintain their Class IIIB classification at their point of use.

1.1.5 This standard shall not apply to processes that use a liquid that does not have a fire point when tested in accordance with ASTM D92, *Standard Test Method for Flash and Fire Points by Cleveland Open Cup*, up to the boiling point of the liquid or up to a temperature at which the sample being tested shows an obvious physical change.

1.1.6 This standard shall not apply to fluidized bed powder application. (See Chapter 15 of NFPA 33.)

1.2* Purpose.

1.2.1 The purpose of this standard shall be to provide requirements for fire safety for dipping, coating, and printing processes that use flammable or combustible liquids. Given that this standard anticipates conditions of average use, the authority having jurisdiction shall be permitted to require additional safeguards or modifications to the requirements of this standard where unusual industrial processes are involved, provided equivalent safety is achieved.

1.2.2* The purpose of this standard shall be to address only the fire and explosion hazards of dipping, coating, and printing processes and operations. This standard shall not address toxicity or industrial hygiene.

1.3 Application. Chapters 4 through 10 and Chapter 12 shall apply to all processes within the scope of this standard. Chapter 11 shall apply only to dipping and coating processes that include electrostatic detearing systems.

1.4 Retroactivity. The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

1.4.1 Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

1.4.2 In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

1.4.3 The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction and only where it is clearly evident that a reasonable degree of safety is provided.

1.5 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

1.5.1 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.5.2 The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

1.6 Units and Formulas. The units of measurement used in this standard shall be the International System of Units, otherwise known as “SI” and “Modernized Metric System.” English customary units are given in parentheses following SI units but shall be considered to be approximate conversions.

1.7 Enforcement. (Reserved)

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2017 edition.

NFPA 11, *Standard for Low-, Medium-, and High-Expansion Foam*, 2016 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 2018 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2016 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, 2017 edition.

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 2017 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 2018 edition.

NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*, 2018 edition.

NFPA 70®, *National Electrical Code®*, 2017 edition.

NFPA 72®, *National Fire Alarm and Signaling Code*, 2016 edition.

NFPA 86, *Standard for Ovens and Furnaces*, 2015 edition.

NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids*, 2015 edition.

NFPA 101®, *Life Safety Code®*, 2018 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, 2018 edition.

NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids*, 2017 edition.

NFPA 750, *Standard on Water Mist Fire Protection Systems*, 2015 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, 2018 edition.

NFPA 5000®, *Building Construction and Safety Code®*, 2018 edition.

2.3 Other Publications.

2.3.1 ANSI Publications. American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI Z535, *Safety Signs Series IS*, 2011.

▲ **2.3.2 ASME Publications.** American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

Boiler and Pressure Vessel Code, Section VIII, 2015.

2.3.3 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM D5/D5M, *Standard Method of Test for Penetration for Bituminous Materials*, 2013.

ASTM D56, *Standard Test Method for Flash Point by Tag Closed Cup Tester*, 2010.

ASTM D92, *Standard Test Method for Flash and Fire Points by Cleveland Open Cup*, 2012.

ASTM D93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester*, 2015a.

ASTM D323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)*, 2015a.

ASTM D3278, *Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus*, 2011.

ASTM D3828, *Standard Test Methods for Flash Point by Small Scale Closed Cup Tester*, 2012a.

ASTM D4359, *Standard Test for Determining Whether a Material is a Liquid or a Solid*, 2012.

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, 2015b.

ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 2016.

ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*, 2015.

2.3.4 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, 2008.

ANSI/UL 2208, *Standard for Solvent Distillation Units*, 2010, revised 2015.

2.3.5 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 30, *Flammable and Combustible Liquids Code*, 2018 edition.

NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*, 2018 edition.

NFPA 70®, *National Electrical Code®*, 2017 edition.

NFPA 5000®, *Building Construction and Safety Code®*, 2018 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate*

Dictionary, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase “standards development process” or “standards development activities,” the term “standards” includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

N 3.3.1 Basement. For the purposes of this code, a story of a building or structure having one-half or more of its height below ground level and to which access for fire-fighting purposes is restricted. [30, 2018]

3.3.2* Boiling Point. The temperature at which the vapor pressure of a liquid equals the surrounding atmospheric pressure. [30, 2018]

3.3.3 Coating Processes.

3.3.3.1 Curtain Coating. A process by which an object or material is coated by passing it through a vertically flowing film of liquid.

3.3.3.2 Dip Coating. A process by which objects or materials are immersed in a liquid coating.

3.3.3.3 Flow Coating. A process by which the coating liquid is discharged in an unatomized state from nozzles, slots, or other openings onto the object or material to be coated.

3.3.3.4 Roll Coating. The process of applying or impregnating objects or materials with the coating liquid by bringing them into contact with a roller that is coated with a liquid.

3.3.4 Container. Any vessel of 450 L (119 gal) or less capacity used for transporting or storing liquids. [30, 2018]

3.3.4.1 Closed Container. A container as herein defined, so sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ordinary temperatures. [30, 2018]

3.3.5 Dip Tank. A tank, vat, or container of flammable or combustible liquid into which objects or materials are immersed for the purpose of coating, cleaning, or similar processes.

3.3.6 [Electrical] Utilization Equipment. Equipment that utilizes electric energy for electronic, electromechanical, chemical, heating, lighting, or similar purposes. [70;100]

3.3.7 Electrostatic Detearing. A process for removing excess wet coating material, such as drips, from the bottom edge of a dipped or coated object or material by passing it through an electrostatic field.

3.3.8 Liquid. Any material that (1) has a fluidity greater than that of 300 penetration asphalt when tested in accordance with ASTM D5/D5M, *Standard Test Method for Penetration of Bituminous Materials*, or (2) is a viscous substance for which a specific melting point cannot be determined but that is determined to be a liquid in accordance with ASTM D4359, *Standard Test for Determining Whether a Material is a Liquid or a Solid*. [30, 2018]

3.3.8.1 Combustible Liquid. Any liquid that has a closed-cup flash point at or above 37.8°C (100°F), as determined by the test procedures and apparatus set forth in Section 4.8. Combustible liquids are classified according to Section 4.7. [30, 2018]

3.3.8.2 Flammable Liquid. Any liquid that has a closed-cup flash point below 37.8°C (100°F), as determined by the test procedures and apparatus set forth in Section 4.8, and a Reid vapor pressure that does not exceed an absolute pressure of 276 kPa (40 psi) at 37.8°C (100°F), as determined by ASTM D323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)*. Flammable liquids are classified according to Section 4.7. [30, 2018]

3.3.9 Material.

N 3.3.9.1 Flammable or Combustible Material. Any material, including its residue, that is used in the spray application process and also meets the definition of a combustible liquid (*see 3.3.8.1*) or a flammable liquid (*see 3.3.8.2*).

N 3.3.9.2 Limited-Combustible Material. See Section 4.6.

N 3.3.9.3 Noncombustible Material. See Section 4.5.

3.3.10 Peripheral Vapor Containment. A system that cools the perimeter of a vapor degreaser tank near its top for the purpose of condensing a saturated vapor blanket from boiling flammable solvent.

3.3.11* Printing. The art of transferring an image from a plate, block, or other device onto a substrate using inks or dyes, including, but not limited to, flexography, gravure, lithography, screen, digital, and UV methods.

3.3.12* Recirculation Particulate Filter. A filter, or series of filters, capable of removing more than 95 percent of particles 0.3 to 10 μ in size from the airstream.

3.3.13 Secondary Enclosure. An enclosure or guard constructed around but separate from a dipping or coating process whose purpose is other than for fire protection, confinement of a possible fire, or confinement of vapor or mists.

3.3.14 Solvent Cleaning. The removal of material from an object by a solvent using processes such as immersing, soaking, spraying, agitating, or ultrasonics.

3.3.15* Vapor Area. Any area that could contain a flammable vapor concentration exceeding 25 percent of the lower flammable limit (LFL) during operation or shutdown periods.

3.3.16 Vapor Source. Any source from which it is possible to measure vapor concentrations exceeding 25 percent of the lower flammable limit at a distance of 305 mm (1 ft) in any direction from the object or material.

3.3.17 Ventilation. The changing of air within a compartment by natural or mechanical means.

Chapter 4 General Requirements

4.1* Location of Dipping, Coating, and Printing Processes. Processes shall be located in industrial occupancies as defined by NFPA 5000.

4.1.1* Industrial Occupancies. Areas in which dipping, coating, or printing operations are conducted shall be protected with approved automatic sprinkler systems that are designed and installed in accordance with the requirements of NFPA 13.

Δ 4.1.2* Locations in Other Occupancies. Processes shall not be located in any building that is classified as an assembly, an educational, a day care, a health care, an ambulatory health care, a detention/correctional, a residential, a mercantile, a business, or a storage occupancy, unless the following requirements are met:

- (1) The process area is separated both vertically and horizontally from all surrounding areas by construction having a fire resistance rating of at least 2 hours.
- (2) The process area is protected by an approved automatic sprinkler system designed and installed in accordance with NFPA 13.

4.2* Separation. Processes shall be separated from other operations, materials, or occupancies by location, fire walls, and horizontal assemblies in accordance with NFPA 5000 or other means acceptable to the authority having jurisdiction.

4.3* Basements. Processes shall not be located in a basement unless all the following requirements are met:

- (1) A means of egress is provided that meets the requirements of Chapter 40 of NFPA 101.
- (2) An access means is provided for emergency response personnel.

4.3.1 Processes utilizing combustible liquids in basements shall be captured and directed to the outside of the building or control equipment.

4.4 Access to Means of Egress. Processes shall be located so that, in the event of a fire originating at or within the process

equipment, access to means of egress is in accordance with NFPA 101.

N 4.5 Noncombustible Material.

N 4.5.1 A material that complies with any one of the following shall be considered a noncombustible material:

- (1)* The material, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat.
- (2) The material is reported as passing ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*.
- (3) The material is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone shaped Airflow Stabilizer, at 750°C*.

[5000:7.1.4.1.1]

N 4.5.2 Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible*. [5000:7.1.4.1.2]

N 4.6 Limited-Combustible Material. A material shall be considered a limited-combustible material where both of the following conditions of 4.6.1 and 4.6.2, and the conditions of either 4.6.3 or 4.6.4, are met. [5000:7.1.4.2]

N 4.6.1 The material does not comply with the requirements for a noncombustible material in accordance with Section 4.5. [5000:7.1.4.2(1)]

N 4.6.2 The material, in the form in which it is used, exhibits a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb) where tested in accordance with NFPA 259. [5000:7.1.4.2(2)]

N 4.6.3 The material has a structural base of a noncombustible material with a surfacing not exceeding a thickness of 3.2 mm ($\frac{1}{8}$ in.) where the surfacing exhibits a flame spread index not greater than 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*. [5000:7.1.4.2.1]

N 4.6.4 The material is composed of materials which, in the form and thickness used, neither exhibit a flame spread index greater than 25 nor evidence of continued progressive combustion when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, and are of such composition that all surfaces that would be exposed by cutting through the material on any plane would neither exhibit a flame spread index greater than 25 nor evidence of continued progressive combustion when tested in accordance with ASTM E84 or UL 723. [5000:7.1.4.2.2]

N 4.6.5 Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible*. [5000:7.1.4.2.3]

N 4.7 Classification of Liquids. Any liquid within the scope of this standard and subject to the requirements of this standard shall be classified in accordance with this section. [30:4.3]