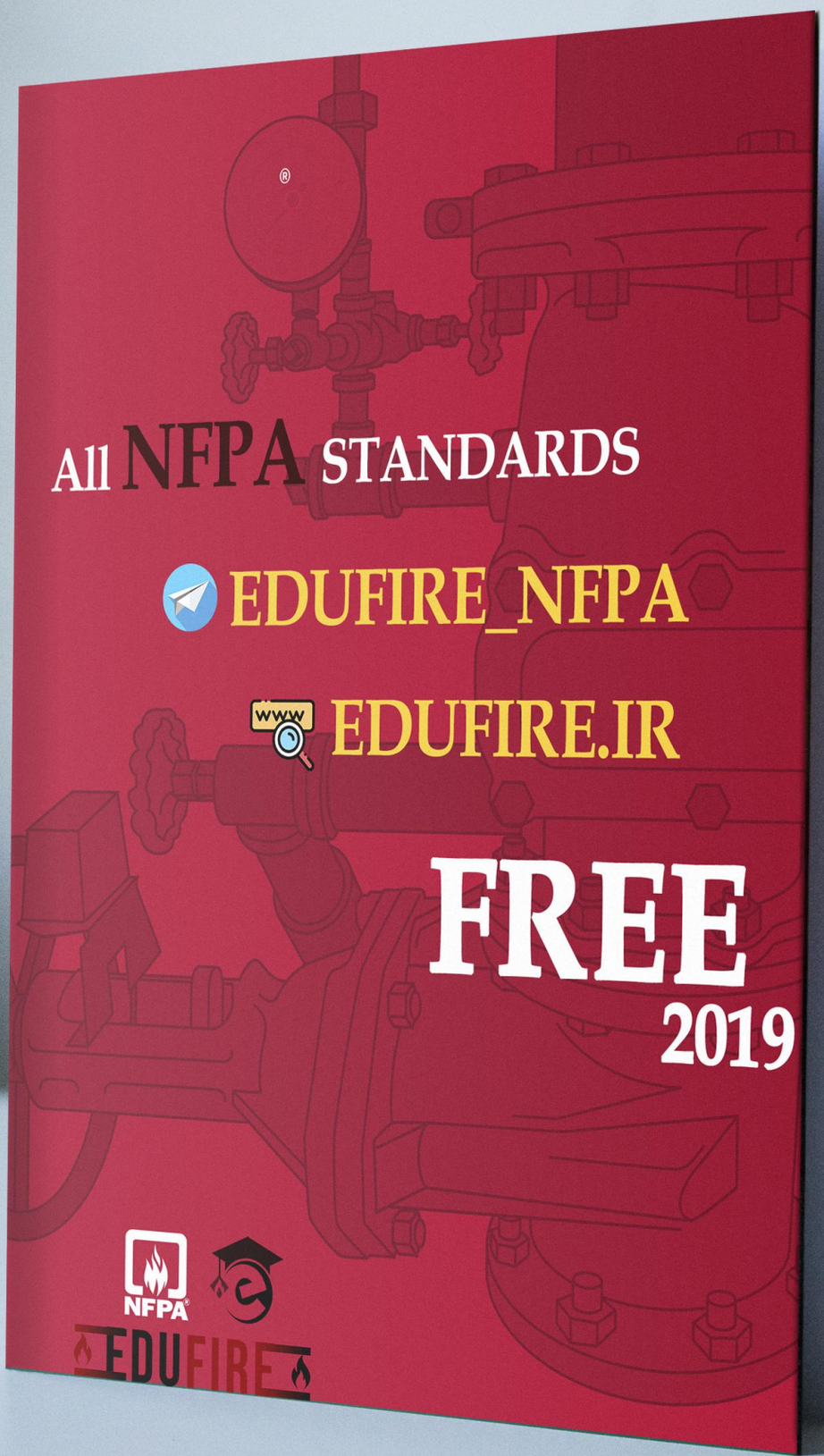
NFPA® 18

Standard on Wetting Agents

2017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NFPA® 18

Standard on

Wetting Agents

2017 Edition

This edition of NFPA 18, *Standard on Wetting Agents*, was prepared by the Technical Committee on Water Additives for Fire Control and Vapor Mitigation. It was issued by the Standards Council on November 11, 2016, with an effective date of December 1, 2016, and supersedes all previous editions.

This edition of NFPA 18 was approved as an American National Standard on December 1, 2016.

Origin and Development of NFPA 18

This standard was originally sponsored by the NFPA General Committee on Special Extinguishing Methods and prepared by the NFPA Committee on Wetting Agents. Initiated and tentatively adopted in 1949, it was officially adopted in 1951. Extensive revisions, most of which were concerned with the use of wetting agent foam, were adopted in 1955. Subsequently, in 1959, responsibility for this standard was transferred to the Committee on Foam, and the standard was amended in 1972 and 1979.

The 1986 and 1990 editions of the standard were reconfirmations of the 1979 edition.

The 1995 edition of the document also was a reconfirmation. However, some editorial changes were incorporated in an effort to make the document more user friendly.

The 2006 edition underwent extensive revisions, both technical and editorial. Technical changes included clarifying the definition of wetting agents and their use on specific types of fires. Specific requirements for wetting agents and the methods for testing were detailed in Chapter 5, and Chapter 6 contained requirements for the supply of wetting agents. Specific packaging requirements were included in Chapter 7, and inspection, testing, and maintenance requirements for systems using wetting agents were detailed in Chapter 8. Editorial changes included updating the structure of the standard to comply with the *Manual of Style for NFPA Technical Committee Documents* and strengthening the language into specific requirements.

The 2011 edition also underwent extensive technical and editorial revision. Technical changes included limits for aquatic toxicity for parity and consistency with other product standards. Editorial changes included updating the structure of the standard to further comply with the *Manual of Style for NFPA Technical Committee Documents*.

The 2017 edition includes both technical and editorial revisions. Technical changes include clarification that all aspects of the listing for wetting agents must be observed, an explanation on the units of the corrosion rate equation in Chapter 5, and a new section within Chapter 5 was created to provide requirements for alternate viscosity test methods for situations where the viscosity is too low to obtain meaningful results. Editorial changes include updating the standard to comply with the *Manual of Style for NFPA Technical Committee Documents*.

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NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents on the manufacture, testing, application, and use of water additives for the control and/or suppression of fire and flammable vapor mitigation including water additives used to prevent or reduce the spread of fire and the use of water additives in fixed, semi-fixed, mobile, and portable fire suppression systems.

Contents

NFPA 18

Standard on

Wetting Agents

2017 Edition

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 B. 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 B.

Chapter 1 Administration

1.1* Scope. This standard addresses qualification tests, methods of evaluation, and general rules for application of wetting agents and wetting agent solutions as related to fire control and extinguishment.

1.2 Purpose. This standard provides the requirements for the performance and use of wetting agents as related to fire control and extinguishment and is prepared for the guidance of the fire services, authorities having jurisdiction, and others concerned with judging the acceptability and use of any wetting agent offered for such a purpose.

1.3 Application. This standard applies to wetting agents and wetting agent solutions for use on Class A and Class B fires.

1.4 Retroactivity. The provisions of this document are considered necessary to provide a reasonable level of protection from loss of life and property from fire. They reflect situations and the state of the art at the time the standard was issued.

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. Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency. The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

1.6 Units and Formulas. When a primary value for measurement in metric units as given in this standard is followed by a parenthetical equivalent value in U.S. units, the primary metric value stated is to be regarded as the requirement.

1.6.1 Metric units of measurement in this standard are in accordance with the modernized metric system known as the International System of Units (SI).

1.6.2 The conversion procedure used for the U.S. units is to multiply the primary SI quantity by the conversion factor and then round the result (if necessary) to the appropriate number of significant digits.

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

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* 2016 edition.

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

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2017 edition.

NFPA 1150, *Standard on Foam Chemicals for Fires in Class A Fuels,* 2017 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus,* 2016 edition.

2.3 Other Publications.

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

ASTM D97, *Standard Test Method for Pour Point of Petroleum Products,* 2012.

ASTM D323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method),* 2014.

ASTM D1293, *Standard Test Methods for pH of Water,* 1999, reapproved 2012.

ASTM D1331, *Standard Test Methods for Surface and Interfacial Tension of Solutions of Surface-Active Agents, and Related Materials,* 1989, reapproved 2014.

ASTM D2196, *Standard Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational Viscometer,* 2015.

ASTM E729, *Standard Guide for Conducting Acute Toxicity Tests on Test Materials with Fishes, Macroinvertebrates, and Amphibians*, 1996, reapproved 2014.

ASTM G1, *Standard Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens*, 2011.

ASTM G31, *Standard Practice for Laboratory Immersion Corrosion Testing of Metals*, 1972, reapproved 2004.

2.3.2 EPA Publications. Environmental Protection Agency, William Jefferson Clinton East Building, 1200 Pennsylvania Avenue, NW, Washington, DC 20460.

OPPTS 835.3110, *Ready Biodegradability*, Section M, CO_2 *Evolution (Modified Sturm)* Test, Fate, Transport, and Transformation Test Guidelines, January 1998.

OPPTS 850.1075, *Fish Acute Toxicity Test, Freshwater and Marine*, Ecological Effects Test Guidelines, 1996.

OPPTS 870.1100, *Acute Oral Toxicity*, Health Effects Test Guidelines, 2002

OPPTS 870.1200, *Acute Dermal Toxicity*, Health Effects Test Guidelines, 1998.

OPPTS 870.2400, *Acute Eye Irritation*, Health Effects Test Guidelines, 1998.

OPPTS 870.2500, *Acute Dermal Irritation*, Health Effects Test Guidelines, 1998.

2.3.3 ISO Publications. International Organization for Standardization, ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland.

ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*, 2005.

2.3.4 NACE Publications. NACE International, 15835 Park Ten Place, Houston, TX 77084-4906.

TM0169, G0031 12A, *Standard Guide for Laboratory Immersion Corrosion Testing of Metals*, 2012.

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

ANSI/UL 162, *Standard for Foam Equipment and Liquid Concentrates*, 1994, revised 2015.

ANSI/UL 711 CAN/ULC S508, *Rating and Fire Testing of Fire Extinguishers*, 2004, revised 2013.

2.3.6 U.S. Government Publications. U.S. Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001.

Title 40, Code of Federal Regulations, Part 160, "Good Laboratory Practice Standards."

Title 40, Code of Federal Regulations, Part 792, "Good Laboratory Practice Standards."

2.3.7 Other Publications.

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

2.4 References for Extracts in Mandatory Sections.

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

NFPA 30, *Flammable and Combustible Liquids Code,* 2015 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 Shall. Indicates a mandatory requirement.

3.2.6 Should. Indicates a recommendation or that which is advised but not required.

3.2.7 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.

3.3.1 Additive. A liquid such as foam concentrates, emulsifiers, and hazardous vapor suppression liquids and foaming agents intended to be added to the water.

3.3.2 Class A Fires. Class A fires are fires in ordinary combustible materials, such as wood, cloth, paper, rubber, and many plastics. [**10:**5.2.1]

3.3.3 Class B Fires. Class B fires are fires in flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammable gases. [**10:**5.2.2]

3.3.4 Class C Fires. Class C fires are fires that involve energized electrical equipment. [**10:**5.2.3]

3.3.5 Class D Fires. Class D fires are fires in combustible metals, such as magnesium, titanium, zirconium, sodium, lithium, and potassium. [**10:**5.2.4]

3.3.6 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 4.4 of NFPA 30. Combustible liquids are classified according to Section 4.3 of NFPA 30. [**30,** 2015]

3.3.7 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 4.4 of NFPA 30, and a Reid vapor pressure that does not exceed an absolute pressure of 40 psi (276 kPa)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 4.3 of NFPA 30. [**30,** 2015]

3.3.8 Wetting Agent. A concentrate that when added to water reduces the surface tension and increases its ability to penetrate and spread.

3.3.9* Wetting Agent Solution. Water to which a wetting agent has been added.

Chapter 4 Uses and Limitations

4.1 General.

4.1.1 Wetting agent concentrates for fire fighting shall comply with 4.1.1.1 through 4.1.1.4.

4.1.1.1 Wetting agent concentrate shall be listed.

4.1.1.2 Wetting agent concentrate shall be mixed only with water.

4.1.1.3 Wetting agent concentrate shall be used in accordance with its listing(s).

4.1.1.4 The use of wetting agent concentrate shall be approved by the authority having jurisdiction.

4.2 Limitations.

4.2.1* General. The use of a wetting agent solution shall be limited to those systems and applications identified by the manufacturer's listing and Section 4.2.

4.2.2 Water-Reactive Chemicals. Wetting agent solution shall have the same limitations as water with respect to extinguishing fires involving chemicals that react with water to create additional hazards.

4.2.3 Class B Fires.

4.2.3.1 The use of wetting agent solution for the extinguishment of fires involving Class B flammable or combustible liquids shall be limited to those fuels not soluble in water.

4.2.3.2* The use of fixed fire extinguishing systems using wetting agent solution(s) shall not be permitted for the extinguishment of fires in commercial cooking equipment that involve combustible cooking media (vegetable or animal oils and fats) unless specifically listed for this hazard.

4.2.4* Class C Fires. Wetting agent solution shall have the same limitations as water with respect to extinguishing fires involving energized electrical equipment.

4.2.5* Class D Fires. Wetting agent solution shall not be used on Class D fires unless specifically listed for that purpose.

4.3 Compatibility of Wetting Agent Concentrate(s) and Solution(s).

4.3.1 Wetting agent concentrate(s) shall not be mixed in the same container with different wetting agent concentrate(s) or additive(s).

4.3.2 Premixed solution(s) prepared with wetting agent concentrate(s) shall not be mixed in the same container with premixed solution(s) prepared with different wetting agent concentrate(s) or additive(s).

4.3.3 Solution generated separately with wetting agent concentrate shall be permitted to be applied to a fire in sequence or simultaneously when approved by the authority having jurisdiction.

4.3.4 Solution generated with wetting agent concentrate and solution generated with other types of concentrate intended for fire prevention, control, suppression, extinguishment, or vapor mitigation shall be permitted to be applied to a fire in sequence or simultaneously when approved by the authority having jurisdiction.

4.4 Concentrations. Wetting agent concentrate shall be used at the prescribed proportion(s), in accordance with its listing(s).

4.5 Health, Safety, and Environmental Considerations.

4.5.1 The mammalian and fish toxicity and biodegradability performance shall meet the requirements shown in 4.5.1.1 through 4.5.1.3.

4.5.1.1 The mammalian toxicity of the wetting agent and wetting agent solution shall meet the requirements shown in Table 4.5.1.1.

4.5.1.2 The fish toxicity of the wetting agent shall not be less than 10 mg/L when tested in accordance with 4.5.1.2.1.

4.5.1.2.1 Rainbow trout *(Oncorhynchus mykiss)* at 60 ± 7 days post-hatch shall be exposed to the wetting agent in accordance with OPPTS 850.1075 and ASTM E729.

4.5.1.2.2 Status conditions in ASTM soft water as described in ASTM E729 at 12°C ± 1°C (54°F ± 2°F) shall be maintained throughout the 96-hour test period.

Table 4.5.1.1 Toxicity Limits for Wetting Agents and Wetting Agent Solutions

				Primary Eye Irritation	
	Acute Oral Toxicity	Acute Dermal Toxicity	Primary Dermal Irritation	Unwashed Eyes	Washed Eyes
Wetting agent	LD_{50} > 500 mg/kg	LD_{50} > 2000 mg/kg	Primary irritation score: <5.0	Mildly irritating or less	Mildly irritating or less
	If LD_{50} ≥ 50 but ≤ 500, protective gear and safe handling procedures recommended	If LD_{50} ≥ 200 but ≤ 2000, protective gear and safe handling procedures recommended	If more irritating, protective gear and safe handling procedures recommended	If more irritating, protective gear and safe handling procedures recommended	If more irritating, protective gear and safe handling procedures recommended
	LD_{50} < 50 not acceptable	LD_{50} < 200 not acceptable			
Wetting agent solution	LD_{50} > 5000 mg/kg	LD_{50} > 2000 mg/kg	Primary irritation score: <5.0	Mildly irritating or less	Mildly irritating or less

4.5.1.3 The wetting agent shall be biodegradable or readily biodegradable as determined by OPPTS 835.3110, Section M.

Chapter 5 Requirements and Test Methods for Wetting Agent Concentrates and Wetting Agent Solutions

5.1 General.

5.1.1 Wetting agent concentrate(s) and wetting agent solution(s) prepared at the concentration(s) specified for use by the manufacturer shall be subjected to the tests in this chapter.

5.1.2 The tests detailed in this chapter shall be conducted by an approved independent laboratory using laboratory practices in accordance with 40 CFR 160 and 40 CFR 792 and calibration competency in accordance with ISO/IEC 17025 or equivalent, as applicable, and the results shall be recorded and made available by the manufacturer on a technical data sheet.

5.1.3 The information developed in response to the requirements of this chapter shall be reported on the manufacturer's technical data sheet and made available to potential users.

5.2 Wetting Agent Concentrates and Solutions.

5.2.1 Concentrates Pour Point. The pour point of the wetting agent concentrate shall be determined in accordance with ASTM D97.

5.2.2 Wetting Agent Concentrate Miscibility.

5.2.2.1 The concentrate shall be miscible in water and result in a visual homogeneous solution when tested at the minimum and maximum concentration specified for use by the manufacturer. Opalescence shall be considered to be visual homogeneous.

5.2.2.2 The miscibility of the wetting agent shall be tested according to the following procedures with the water and concentrate conditioned to the temperature combinations of Table 5.2.2.2:

(1) Five hundred (500) mL (16.9 fl oz) of de-ionized or distilled water conditioned to the test temperature shall be added to a 1 L (0.26 gal) glass beaker.
(2) A stirrer, as illustrated in Figure 5.2.2.2, shall be inserted into the water to a depth of 140 mm ± 5 mm (5½ in. ± ¼ in.).
(3) The speed of the stirrer motor shall be adjusted to 60 rpm ± 10 rpm.
(4) The required amount of concentrate conditioned to the test temperature shall be added to the water within 2 seconds.
(5) After 10 revolutions of the stirrer, rotation shall be stopped and the liquid mixture shall be visually examined. If the solution is visually homogeneous, the number of revolutions shall be recorded and the result recorded as miscible.
(6) If the solution is not visually homogeneous, it shall be stirred for an additional 10 revolutions.
(7) The procedure shall be repeated until the solution is visually homogeneous or until the total number of revolutions is equal to 100.
(8) At each 10-revolution interval, the stirrer rotation shall be stopped and the liquid mixture shall be visually examined for homogeneity. If the solution is visually homogeneous, the number of revolutions shall be recorded and the result recorded as miscible.
(9) If the solution is not visually homogeneous immediately following 100 revolutions, the result shall be recorded as not miscible.

5.2.3* Wetting Agent Concentrate Separation.

5.2.3.1 Wetting agent concentrate shall not stratify or otherwise separate when stored undisturbed for 30 days in closed, sealable, 100 mL (3.38 fl oz) transparent containers at temperatures of 0°C ± 2°C (32°F ± 3°F) and 49°C ± 2°C (120°F ± 3°F).

5.2.3.2 Visible separation shall be considered the formation of two or more distinct layers; stratification or precipitation occurring during the course of the test shall be considered as an indication of separation.

Table 5.2.2.2 Temperature Combinations of Wetting Agent and Water for Miscibility Testing

Water Temperature		Wetting Agent Temperature	
°C	°F	°C	°F
4 ± 1	39 ± 1.5	21 ± 1	70 ± 1.5
21 ± 1	70 ± 1.5	21 ± 1	70 ± 1.5
4 ± 1	39 ± 1.5	4 ± 1	39 ± 1.5
21 ± 1	70 ± 1.5	4 ± 1	39 ± 1.5

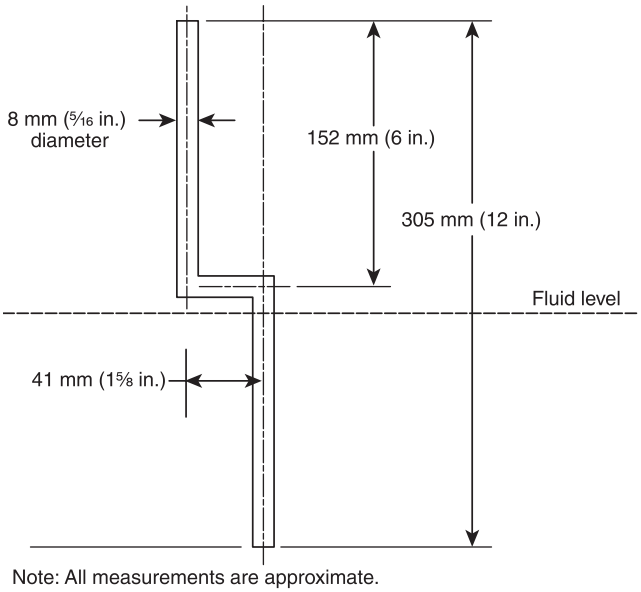

FIGURE 5.2.2.2 Stirrer Shaft for Miscibility Test.

5.2.4 Impact of Low Temperature of Wetting Agent Concentrate on Surface Tension.

5.2.4.1* Surface tension of 100 mL (3.38 fl oz) of wetting agent solution prepared from wetting agent concentrate samples stored at −18°C ± 2.7°C (0°F ± 5°F) for 16 hours and then conditioned to 18°C ± 2.7°C (65°F ± 5°F) shall not vary more than 5 dynes/cm (0.00092 lb/in.) from the initial measurement determined in accordance with 5.3.1.

5.2.4.2 The wetting agent solution shall be prepared at the minimum and maximum concentrations specified for use by the manufacturer.

5.2.4.3 The surface tension shall be determined in accordance with ASTM D1331.

5.2.5* Wetting Agent Concentrate pH. When tested in accordance with ASTM D1293, the pH of the concentrate shall be between 6 and 9 at 18°C ± 2.7°C (65°F ± 5°F).

5.2.6 Wetting Agent Concentrate Viscosity. The viscosity of the wetting agent concentrate shall be measured at the temperatures of 2°C ± 2.7°C (35°F ± 5°F), 18°C ± 2.7°C (65°F ± 5°F), and 49°C ± 2.7°C (120°F ± 5°F) in accordance with ASTM D2196, as modified by the following:

(1) A Brookfield viscometer, LV series, or the equivalent, set at 60 rpm with the appropriate spindle (No. 2 for viscosities from 1 to 500 centipoise and No. 4 for viscosities greater than 500 centipoise), shall be used to measure the viscosity.
(2) A straight-sided glass beaker that contains approximately 800 mL (27 fl oz) of the test sample shall be positioned under the viscometer.
(3) The spindle shall be immersed in the concentrate to the depth indicated on the spindle.
(4) The viscometer then shall be turned on, and the spindle shall be allowed to rotate for 1 minute prior to the measurement being taken.
(5) Triplicate measurements shall be made, with the test sample gently stirred between measurements, and the viscosity of each sample shall be calculated in centipoise, using the applicable multiplier (5 for spindle No. 2 and 100 for spindle No. 4).
(6) The viscosity measurements for each sample shall then be averaged.
(7) The results of viscosity testing shall be reported in terms of absolute viscosity (centipoise).

5.2.7 Alternate Viscosity Test Methods.

5.2.7.1* Where the preferred method does not provide usable results, an alternative test method shall be permitted.

5.2.7.2 Where an alternative test method is used, the method, test conditions, and results shall be documented and reported.

5.2.8 Wetting Agent Concentrate and Solution Toxicity.

5.2.8.1* Mammalian Toxicity.

5.2.8.1.1 Wetting agent concentrate and wetting agent solution prepared at the maximum concentration specified for use by the manufacturer shall be tested in accordance with the following Environmental Protection Agency Office of Prevention, Pesticides, and Toxic Substances (EPA OPPTS) tests or their equivalents:

(1) OPPTS 870.1100, for acute oral toxicity
(2) OPPTS 870.1200, for acute oral toxicity
(3) OPPTS 870.2400, for acute eye irritation
(4) OPPTS 870.2500, for acute dermal irritation

5.2.8.1.2 The wetting agent concentrate and wetting agent solution prepared at the maximum concentration specified for use by the manufacturer shall not exceed the toxicity limits established in Table 4.5.1.1 when tested in accordance with 5.2.8.1.1.

5.2.8.2 Wetting Agent Concentrate Aquatic Toxicity. The LC_{50} of the wetting agent concentrate shall be greater than 10 mg/L when tested in accordance with all of the following:

(1) Wetting agent concentrate samples shall be tested, using rainbow trout (*Oncorhynchus mykiss*), in accordance with U.S. EPA OPPTS 850.1075 in soft water as defined in ASTM E729.
(2) In accordance with OPPTS 850.1075, 10 fish that are 60 days ± 15 days post-hatch shall be exposed under static conditions to each level of a wetting agent solution that contains soft water for 96 hours at 12°C ± 1°C (54°F ± 2°F).

5.2.8.3* Wetting Agent Concentrate Biodegradability. The biodegradability of the wetting agent concentrate shall be evaluated in accordance with this subsection, and the results recorded on the manufacturer's data sheet.

5.2.8.3.1 The evaluation shall be in accordance with U.S. EPA OPPTS 835.3110 or equivalent.

5.2.8.3.2 Testing shall be conducted for a minimum of 28 days and shall be continued until an oxygen depletion plateau is reached.

5.2.8.3.3 Testing shall be discontinued at the end of 42 days, even if the plateau has not been reached.

5.2.8.3.4 At least one reference substance shall be used to monitor inoculum activity.

5.2.9* Wetting Agent Concentrate Corrosion. Testing of the corrosive effects of wetting agent solutions shall be conducted in accordance either with NACE TM0169 or with ASTM G1 and ASTM G31 and in accordance with 5.2.9.2 through 5.2.9.7.

5.2.9.1 Results. Results of the average of replicate tests shall be less than or equal to the values found in Table 5.2.9.1. The results of the testing shall be included in the manufacturer's technical data sheet.

5.2.9.2* Samples. The wetting agent and its solutions shall be tested for corrosion with sample coupons of 4130 mild steel, 2024-T3 aluminum, and UNS C27000 yellow brass, which is 65 percent copper and 35 percent zinc.

5.2.9.2.1 The wetting agent and its solutions shall be tested at the maximum and minimum use concentrations specified by the manufacturer.

5.2.9.3 Marking and Measurement. Each coupon, 25 mm × 102.6 mm × 3.2 mm (1 in. × 4 in. × ⅛ in.), shall be marked (by vibrating engraver) with a unique identification code, drilled in the upper center to insert the braided Dacron string used to suspend it, and then measured to the nearest 0.01 mm (0.000394 in.) for each dimension (length, width, and thickness).

5.2.9.4 Cleaning and Drying. Each coupon shall be degreased and rinsed in tap water.

5.2.9.4.1 The degreased coupon shall not be touched with a bare hand.

5.2.9.4.2 Procedure for Cleaning.

5.2.9.4.2.1 The coupons shall be cleaned chemically as described in Table 5.2.9.4.2.1, rinsed in distilled water, wiped to remove the water film, and dried at 55°C (130°F) for 15 to 30 minutes.

5.2.9.4.2.2 The coupon weight shall be recorded for use in determining weight loss at the end of the 90-day storage period.

5.2.9.4.3 The coupons shall be cooled to room temperature, shall be weighed to 0.1 mg (0.00154 grain), and shall be used immediately or stored in a desiccator until use.

5.2.9.5 Test Setup. One coupon shall be suspended by a length of braided Dacron fishing line in a 0.95 L (32 oz) glass jar in such a way that the coupon does not touch the sides or bottom of the jar.

5.2.9.5.1 Each jar shall contain 0.8 L (24 oz) of liquid for total immersion tests or 0.4 L (12 oz) of liquid for partial immersion tests.

5.2.9.5.2 For partial immersion tests, the coupon shall be suspended so that one-half its length is immersed in the liquid and one-half its length is exposed to the vapor.

5.2.9.5.3 For total immersion tests, the coupon shall be completely covered with liquid.

Table 5.2.9.1 Maximum Allowable Corrosion Rates

	2024-T3 Aluminum				4130 Steel				Brass[a]	AZ31B Magnesium			
	Total Immersion		Partial Immersion		Total Immersion		Partial Immersion		Partial Immersion	Total Immersion		Partial Immersion	
Application	21°C (70°F)	49°C (120°F)	21°C (70°F)	49°C (120°F)	21°C (70°F)	49°C (120°F)	21°C (70°F)	49°C (120°F)	49°C (120°F)	21°C (70°F)	49°C (120°F)	21°C (70°F)	49°C (120°F)
Wetting agent concentrates	2.0	2.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0[b]	5.0[b]	5.0[b]	5.0[b]
Wetting agent solutions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fixed-wing aircraft	2.0[c]	2.0[c]	2.0[c]	2.0[b]	5.0	5.0	5.0	5.0	5.0	—	—	—	—
Helicopter with fixed tank	2.0[c]	2.0[c]	2.0[c]	2.0[b]	5.0	5.0	5.0	5.0	5.0	4.0[c]	4.0[c]	4.0[c]	4.0[c]
Helicopter with bucket	2.0	2.0	2.0	2.0	5.0	5.0	5.0	5.0	5.0	—	—	—	—
Ground application[d]	2.0	2.0	2.0	2.0	5.0	5.0	5.0	5.0	5.0	—	—	—	—

Note: All values in milli-inches (mil) per year; for SI units, 1 mil = 2.54×10^{-2} mm.

[a]Composition of brass is 65 percent copper, 35 percent zinc.

[b]Required only if submitted for use in helicopters equipped with fixed tanks or if the concentrate is contained on board the helicopter.

[c]Intergranular corrosion tests also required; see 4.3.4.2 of NFPA 1150.

[d]Includes fire apparatus, portable pumps, backpacks, and other such devices.

Table 5.2.9.4.2.1 Procedure for Cleaning Corrosion Coupons

Alloy	Chemical	Time (minutes)	Temperature	Remarks*
Brass	15–20% HCl	2–3	Room	Follow with light scrub using nonmetallic brush†
Steel	50 g SnCl + 20 g $SbCl_3$ in 1 L concentrated HCl	3–5	Cold	Follow with light scrub using nonmetallic brush†
2024-T3 aluminum	70% concentrated HNO_3	2–3	Room	Follow with light scrub using nonmetallic brush†

For U.S. customary units, 1 g = 0.035 oz, 1 L = 33.8 fl oz.
*Cleaning solutions should be discarded as they become used or discolored. If their usability is in doubt, they should be replaced. For the cleaning of exposed coupons, the solution for each wetting agent concentrate or solution tested should be replaced.
†A rubber stopper, nonmetallic scrubbing pad, or nonmetallic brush, such as a toothbrush, can be used.

5.2.9.5.4 Each jar shall be closed with a screw cap, labeled with coupon identification and starting date, and put in an incubator at 21°C or 49°C (70°F or 120°F), depending on the desired test condition.

5.2.9.6 Test Duration and Completion. Jars containing the test liquid (three at each exposure and temperature) shall stand undisturbed for 90 days.

5.2.9.6.1 At the end of the 90-day test period, the coupons shall be removed from the liquid and rinsed under running water to remove loosely attached corrosion products.

5.2.9.6.2 The coupons shall be scrubbed with a toothbrush, nonmetallic scouring pad, or other nonmetallic brush to aid in removal of scale.

5.2.9.6.3 The coupons shall be cleaned chemically using the same procedures that were used initially in accordance with Table 5.2.9.4.2.1.

5.2.9.6.4 A clean, unused coupon shall be cleaned in the same manner to serve as a control for weight lost during the cleaning process.

5.2.9.6.5 After the coupons have been rinsed in distilled water, oven-dried, and cooled, the final weight of each coupon shall be determined to 0.1 mg (0.00154 grain).

5.2.9.7 Corrosion Rate.

5.2.9.7.1* The corrosion rate (Cr) in mils per year (MPY) shall be calculated for each sample as follows:

[5.2.9.7.1]

$$Cr = 534\left(\frac{Wt_i - Wt_f - Wt_c}{At\rho}\right)$$

where:
Wt_i = initial coupon weight (mg)
Wt_f = final coupon weight (mg)
Wt_c = weight loss of the control (mg)
A = area of the coupon ($in.^2$)
t = exposure (hours)
ρ = density of the alloy ($lb/in.^3$) as follows: 4130 steel = 0.28 $lb/in.^3$; yellow brass = 0.3 $lb/in.^3$; 2024–T3 aluminum = 0.1 $lb/in.^3$ (0.1 $lb/in.^3$)

5.2.9.7.2 Results of replicate tests shall be averaged.

5.3 Wetting Agent Solutions.

5.3.1 Solution Surface Tension. The surface tension of wetting agent solution prepared in the minimum and maximum concentrations specified for use by the manufacturer shall be determined in accordance with ASTM D1331.

5.3.1.1 The surface tension of wetting agent solution prepared from wetting agent concentrate as received from the manufacturer and conditioned to 18°C ± 2.7°C (65°F ± 5°F) shall reduce the surface tension to less than 33 dynes/cm (0.006072 lb/in.).

5.3.2 Solution Separation.

5.3.2.1 Wetting agent solution, in the minimum and maximum concentrations specified for use by the manufacturer, shall display no tendency to stratify or otherwise separate when stored undisturbed for 30 days in closed, sealable, 100 mL (3.38 oz) transparent containers at temperatures of 0°C ± 2°C (32°F ± 3°F), 19.5°C ± 4.5°C (67°F ± 8°F), and 49°C ± 2°C (120°F ± 3°F).

5.3.2.2 Visible separation characterized by the formation of two or more distinct layers, stratification, or precipitation occurring during the course of the test shall be considered an indication of separation.

5.3.3* Wetting Agent Solution Corrosion.

5.3.3.1 Testing of the corrosive effects of wetting agent solutions shall be conducted in accordance with 5.2.9 for the manufacturer's recommended minimum and maximum concentrations.

5.3.3.2 The results of the testing shall be included in the manufacturer's technical data sheet.

Chapter 6 Class A Fire Extinguishment Tests

6.1 General. Products listed for use on Class A fires shall pass all the fire tests specified in this chapter.

6.2 Wood Crib Fire Test.

6.2.1 The ability of a wetting agent solution to extinguish wood crib fires shall be determined with the solution prepared

at the minimum concentration specified for use by the manufacturer.

6.2.2 Tests shall be conducted according to the procedures detailed in this section and ANSI/UL 711 CAN/ULC S508 for Class A fires utilizing a 3-A wood crib.

6.2.3 The solution shall be applied with a nominal 9.5 L (2.5 gal) listed 2-A rated water extinguisher.

6.3 Deep-Seated Fire Test.

6.3.1 Wetting agent solutions shall extinguish deep-seated cotton fires and exhibit less runoff than water when tested in accordance with 6.3.2 and 6.3.3.

6.3.2 Tests shall be conducted three times with plain water and three times with the wetting agent solution prepared at the manufacturer's recommended concentrations.

6.3.3 The tests shall be conducted using a cylindrical basket of perforated sheet steel, 114 mm (4½ in.) in diameter and 178 mm (7 in.) high, and ginned cotton weighing 100 g (3.5 oz) shall be used and the test conducted as follows:

(1) Stuff 50 g (1.75 oz) of cotton into the bottom half of the basket.
(2) Heat a steel rod 35 mm (1.38 in.) in diameter and 33 mm (1.3 in.) long to 593°C (1100°F).
(3) Place the rod on the cotton in the basket.
(4) Immediately insert 50 g (1.75 oz) of cotton into the basket on top of the rod.
(5) Pour 250 mL (8.5 fl oz) of test liquid (water or wetting agent solution) onto the cotton and catch the runoff in a pan placed below the basket.
(6) Measure and record the volume of runoff.

6.4 Wood Fiberboard Penetration.

6.4.1 Wetting agent solutions shall extinguish wood fiberboard fires and exhibit less runoff and weight loss than water when tested in accordance with 6.4.2 and 6.4.3.

6.4.2 Tests shall be conducted three times with plain water and three times with the wetting agent solution prepared at the manufacturer's recommended concentrations.

6.4.3 Penetration tests shall be conducted as follows:

(1) Weigh fiber insulation board squares measuring 305 mm × 305 mm × 13 mm (12 in. × 12 in. × ½ in.) and place them on a wire grid.
(2) Expose each insulating board sample to an alcohol flame from a burning pan that is placed immediately below the sample board.
(3) Expose the flame to the board for 1¾ minutes (105 seconds).
(4) Remove the fuel pan and place a clean, dry pan under the board to collect the water or agent runoff.
(5) Spray 250 mL (8.5 fl oz) of test liquid (water or wetting agent solution) on the upper surface of the insulation board using a small sprinkler bottle.
(6) Place pans underneath the board to catch any runoff that occurs.
(7) Measure and record the volume of runoff.
(8) Dry and weigh the boards and calculate the weight loss.

Chapter 7 Class B Fire Extinguishment Tests

7.1* General. Products listed for use on Class B fires shall pass all the fire tests specified in this chapter.

7.2 Listing. Wetting agent solutions at the concentrations specified by the manufacturer shall be evaluated to and comply with the requirements of ANSI/UL 711 CAN/ULC S508 for Class B fires.

7.3 Test Method. Tests for Class B fires shall be conducted as follows:

(1) A 4.65 m^2 (50 ft^2) 20 B pan fitted as described in ANSI/UL 711 CAN/ULC S508 with a backboard that is the width of the pan and 0.9 m (3 ft) high shall be used.
(2) A 51 mm (2 in.) layer of heptane fuel shall be floated on a 102 mm (4 in.) depth of water.
(3) The fuel in the pan shall be ignited and allowed to free burn for 60 seconds.
(4) A 37.9 L/min (10 gpm) nozzle shall be used to apply the wetting agent solution to the fire using one, or a combination, of the following methods:
    (a) The nozzle shall be fixed in position at an angle above the horizontal in order to direct the discharge across the pan onto the backboard for the entire duration of the test.
    (b) The nozzle shall be permitted to be moved as necessary for control and extinguishment.
(5) In no case shall the nozzle extend over any part of the test pan.
(6) The fire shall be extinguished within 5 minutes of the start of application of the wetting agent solution.

7.4 Performance Requirement. Extinguishment shall be achieved in two consecutive tests.

Chapter 8 Wetting Agent Supply

8.1 System Requirements.

8.1.1* Equipment. Wetting agent concentrate that complies with this standard shall be permitted for use with standard equipment provided said equipment is designed primarily to utilize water or foam as a medium of fire control and extinguishment.

8.2 Fire Department Wetting Agent Supply Requirements.

8.2.1 Tanks. The manufacturer of the wetting agent concentrate shall specify whether premixing is allowed.

8.2.2* Separate Supplies. Where portable tanks are not a part of the apparatus, or where it is desired to carry the wetting agent separately for use either with water from portable tanks or with water from other sources of supply, concentrate shall be carried in a tank connected to proportioning equipment on the apparatus installed in accordance with NFPA 1901 and/or in the manufacturer's original container.

8.3* Fixed Systems. Fixed systems utilizing wetting agent solution shall be permitted to be installed in accordance with one of the following standards only after an engineering analysis acceptable to the authority having jurisdiction has been conducted:

(1) NFPA 13, *Standard for the Installation of Sprinkler Systems*
(2) NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*
(3) NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*

Chapter 9 Packaging and Labeling

9.1 Packaging.

9.1.1* Regulations. Packaging of wetting agent concentrates shall conform to regulations governing ground and air transport of materials.

9.1.2 Containers. Containers shall comply with the construction requirements of Section 5.2.1 of ANSI/UL 162, and nonmetallic containers shall comply with the accelerated storage test in Section 22.3 of ANSI/UL 162.

9.2 Storage.

9.2.1 Facilities for storing the concentrate and the premix solution in accordance with the recommendations of the manufacturer shall be provided.

9.2.2 Wetting agent concentrate shall not be stored at a temperature below 0°C (32°F) or above 49°C (120°F).

9.3 Labeling. The manufacturer shall provide the following information on a label permanently attached to the concentrate container:

(1) Manufacturer name and address
(2) Product name, lot number, and date of manufacture
(3) Manufacturer's listed concentrations for each listed application
(4) Recommended minimum and maximum storage temperatures
(5) Suitability for premixing
(6) Emergency and first aid instructions
(7) Volume of wetting agent in container
(8) Listing agency mark

Chapter 10 Inspection, Testing, and Maintenance of Fixed Systems

10.1* Fixed Extinguishing Systems. Fixed extinguishing systems referenced in Section 6.3 shall be inspected, tested, and maintained in accordance with the applicable system requirements of NFPA 25.

10.2 Inspection of Wetting Agent Concentrate. Annually, samples of wetting agent concentrate shall be sent to the manufacturer or qualified laboratory for quality condition testing.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.1 The addition of a listed wetting agent to water increases the water's penetrating abilities and might also provide emulsifying and foaming characteristics. Wetting agent solutions extend the efficiency of water in protection against fire exposure and the extinguishment of Class A and Class B fires in ordinary combustibles and combustible liquids that are insoluble in water and ordinarily stored at atmospheric temperatures and pressures.

In general, wetting agents can be effectively applied and used with fire protection equipment where water is normally used. The degree of efficiency obtained depends on utilization of the most efficient application methods, techniques, and devices for the hazard involved.

When water containing a listed wetting agent is applied to a fire, some of the wetting agent can be expected to remain after extinguishment. This residual wetting agent can be effective in reducing the surface tension of water that might subsequently be applied.

The volume of wetting agent solution required can vary with each type of system and hazard. If used in a water-based fire suppression system, the standard applicable to that system applies.

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.4 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.9 Wetting Agent Solution. The term *water* as used in the standard includes all potable supplies. However, water from other sources can be used provided tests indicate the satisfactory performance of the specific wetting agent under consideration.

A.4.2.1 It is not the intent of this standard to address portable fire extinguishers, which are addressed in NFPA 10.

A.4.2.3.2 Fire test requirements for protection of commercial cooking equipment are addressed by ANSI/UL 300 for fixed fire extinguishing systems. The fire protection requirements for combustible cooking media protection are addressed under NFPA 17 and NFPA 17A.

A.4.2.4 Should wetting agent solution come in contact with electrical equipment, the wetting agent can remain behind after the water has evaporated and can constitute a hazard when the equipment is put back in operation.

A.4.2.5 Fire test requirements for protection of Class D hazards are addressed by ANSI/UL 711 CAN/ULC S508.

Different wetting agent concentrates and their solutions can be incompatible. Such incompatibilities can result in any or all of, but are not be limited to, the following conditions:

(1) Loss of fire-fighting performance
(2) Coagulation or jelling of the concentrate or solution, which can alter flow
(3) Improper proportioning rates
(4) Increased corrosion or other structural damage
(5) Inability to maintain a stable solution

Provided that the blending and application of water agent and water additive solutions is conducted using separate delivery equipment (to avoid the potential conditions noted in the preceding list), it can be beneficial to apply more than one type of wetting agent and/or water additive solution (including conventional foam solutions as governed by NFPA 11 and NFPA 1150), to take advantage of different product features and benefits.

It can be beneficial to use two or more different technologies to suppress a fire. For example, apply a wetting agent solution on a three-dimensional fuel fire to achieve suppression and then apply a conventional Class B foam blanket to provide an extra margin of safety and additional exposure protection for the resulting pooled fuel collected underneath the three-dimensional object.

Every care should be taken to avoid applying divergent technologies together, directed at the same delivery point or target, to avoid one product interfering with another, rendering one or both less effective.

A.5.2.3 Solutions in such concentrations as are specified for use by the manufacturer are to be used, and an average of three determinations should be the reported value. Measurements are carried out on any standard instrument, such as the du Nouy tensiometer, and the proper correction factor is applied to the determined values.

A.5.2.4.1 There can be significant variation between surface tension results obtained from different tensiometers or different operators. This is especially true with older-style manual equipment, when there are different operators or long periods of time between measurements. To minimize the impact of variation on the results of the comparative tests, scheduling an evaluation so that the surface tensions to be compared can be measured by the same operator on the same equipment is best. When that is not possible, measurements of known fluids such as water can be used to assess the amount of variation. The results of the surface tension measurements on the control fluid should be recorded with the results of the test product.

A.5.2.5 The pH of aqueous solutions of wetting agents is a measure of the acidity and the alkalinity of the solution. Variations substantially below 7 or above 12 can either result in a serious increase in corrosion rate or have material effect on a solution's value in fire protection and fire extinguishment.

The pH should be measured in accordance with standard practice procedures on a standard-type pH meter at water temperatures of 15.6°C ± 0.6°C (60°F ± 1°F). Any municipal waterworks laboratory can perform these tests.

A.5.2.7.1 One example of when an alternative test method might be used is when viscosity is too low to produce meaningful results.

A.5.2.8.1 Other organizations, such as the Organization for Economic Cooperation and Development (OECD), have similar tests that can be substituted with the approval of the authority having jurisdiction.

A.5.2.8.3 A rating of "readily biodegradable" or "biodegradable," as recommended in OPPTS 835.3110, should be acceptable. A product is defined in accordance with OPPTS as readily biodegradable when it is greater than or equal to 60 percent biodegraded within 28 days and as biodegradable when it is greater than or equal to 60 percent biodegraded within 29–42 days.

A.5.2.9 For continuous storage, the manufacturer's guidance should be sought for materials of construction or coatings other than those tested. Wetting agents, although they can have limited corrosiveness, exhibit a tendency to accelerate corrosion due to the cleaning and penetrating action and will penetrate and loosen unbonded coatings.

A.5.2.9.2 Testing on additional alloys might be necessary in order to meet the needs of the end user. Wetting agent solutions should be tested for compatibility with the materials with which they will be used in accordance with Chapter 5.

A.5.2.9.7.1 This equation uses a mixed system of units (weight is in milligrams, area of the coupon square inches, and density in pound per cubic inch). The constant value in the equation (534) accounts for the use of mixed units.

A.5.3.3 Generally, wetting agent solutions have a cleaning action and will remove from metal surfaces grease, oil, mill scale, protective coatings, and so forth, that normally protect metal from the corrosive attack of water.

A.7.1 Although wetting agent solutions and Class B foams are required to pass Class B fire performance tests to obtain a listing, the tests are different. Some of the most important differences are as follows:

(1) The tested application rate for wetting agent solutions is 8.1 L/min·m^2 (0.2 gpm/ft^2) under NFPA 18. The tested application rate for Class B foam solutions is 1.6 L/min·m^2 to 2.4 L/min·m^2 (0.04 gpm/ft^2 to 0.06 gpm/ft^2) under NFPA 11.
(2) There are no burnback or sealability requirements for wetting agent solutions.
(3) There is no published application rate in NFPA 18.

There is limited, if any, experience with the extinguishment of fires in extreme depth, such as tank or dike fires.

A.8.1.1 The method whereby the wetting agent concentrate is added to water is not herein specified. The solution can be premixed in tanks or can result from bringing the wetting agent concentrate into contact with water by any suitable proportioning device, provided said device is approved in accordance with applicable standards.

A.8.2.2 Where such equipment is also used to take suction from a potable water supply, extra care should be exercised to prevent contamination of potable water supplies with the wetting agent concentrate or solution.

A.8.3 In such installations, consideration should be given primarily to limitations outlined in Chapter 4 and to the following:

(1) The possibility of increased water damage due to the potentially high absorption ability of the wetting agent solution
(2) The possibility of increased floor loads due to the potential retention of large volumes of wetting agent solution
(3) The potential for contamination of the public water supply where a fixed system is supplied through the fire department connection

If, during pre-incident planning, supplying a fixed system with a wetting agent solution is considered, an engineering evaluation should be conducted.

A.9.1.1 Wetting agent containers should conform to the United Nations performance-based packaging standards as codified under U.S. Department of Transportation Regulations, 49 CFR 178, Subpart M.

A.10.1 Due to its potentially greater penetrating power, wetting agent solution is capable of passing through small openings that would be impassable to water. For that reason, old, but apparently sound, equipment has a tendency to leak when charged with wetting agent solution, especially at worn packing glands.

Packing glands, retainers, bushings, threaded joints, and screw unions should be inspected and replaced as necessary, and regular inspections should be held thereafter.

Annex B Informational References

B.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

B.1.1 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 17, *Standard for Dry Chemical Extinguishing Systems*, 2017 edition.

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

NFPA 1150, *Standard on Foam Chemicals for Fires in Class A Fuels*, 2017 edition.

B.1.2 Other Publications.

B.1.2.1 EPA Publications. Environmental Protection Agency, William Jefferson Clinton East Building, 1200 Pennsylvania Avenue, NW, Washington, DC 20460.

OPPTS 835.3110, *Ready Biodegradability*, Section M, *CO_2 Evolution (Modified Sturm) Test*, Fate, Transport, and Transformation Test Guidelines, January 1998.

B.1.2.2 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 300, *Standard for Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment,* 2005, revised 2014.

ANSI/UL 711 CAN/ULC S508, *Rating and Testing of Fire Extinguishers,* 2004, revised 2013.

B.1.2.3 U.S. Government Publications. U.S. Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001.

Title 49, Code of Federal Regulations, Part 178, Subpart M, "Testing of Non-bulk Packagings and Packages."

B.2 Informational References. (Reserved)

B.3 References for Extracts in Informational Sections. (Reserved)

Index

Sequence of Events for the Standards Development Process

Once the current edition is published, a Standard is opened for Public Input.

Step 1 – Input Stage

- Input accepted from the public or other committees for consideration to develop the First Draft
- Technical Committee holds First Draft Meeting to revise Standard (23 weeks); Technical Committee(s) with Correlating Committee (10 weeks)
- Technical Committee ballots on First Draft (12 weeks); Technical Committee(s) with Correlating Committee (11 weeks)
- Correlating Committee First Draft Meeting (9 weeks)
- Correlating Committee ballots on First Draft (5 weeks)
- First Draft Report posted on the document information page

Step 2 – Comment Stage

- Public Comments accepted on First Draft (10 weeks) following posting of First Draft Report
- If Standard does not receive Public Comments and the Technical Committee chooses not to hold a Second Draft meeting, the Standard becomes a Consent Standard and is sent directly to the Standards Council for issuance (see Step 4) or
- Technical Committee holds Second Draft Meeting (21 weeks); Technical Committee(s) with Correlating Committee (7 weeks)
- Technical Committee ballots on Second Draft (11 weeks); Technical Committee(s) with Correlating Committee (10 weeks)
- Correlating Committee Second Draft Meeting (9 weeks)
- Correlating Committee ballots on Second Draft (8 weeks)
- Second Draft Report posted on the document information page

Step 3 – NFPA Technical Meeting

- Notice of Intent to Make a Motion (NITMAM) accepted (5 weeks) following the posting of Second Draft Report
- NITMAMs are reviewed and valid motions are certified by the Motions Committee for presentation at the NFPA Technical Meeting
- NFPA membership meets each June at the NFPA Technical Meeting to act on Standards with "Certified Amending Motions" (certified NITMAMs)
- Committee(s) vote on any successful amendments to the Technical Committee Reports made by the NFPA membership at the NFPA Technical Meeting

Step 4 – Council Appeals and Issuance of Standard

- Notification of intent to file an appeal to the Standards Council on Technical Meeting action must be filed within 20 days of the NFPA Technical Meeting
- Standards Council decides, based on all evidence, whether to issue the standard or to take other action

Notes:

1. Time periods are approximate; refer to published schedules for actual dates.
2. Annual revision cycle documents with certified amending motions take approximately 101 weeks to complete.
3. Fall revision cycle documents receiving certified amending motions take approximately 141 weeks to complete.

Committee Membership Classifications[1,2,3,4]

The following classifications apply to Committee members and represent their principal interest in the activity of the Committee.

1. M *Manufacturer:* A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.
2. U *User:* A representative of an entity that is subject to the provisions of the standard or that voluntarily uses the standard.
3. IM *Installer/Maintainer:* A representative of an entity that is in the business of installing or maintaining a product, assembly, or system affected by the standard.
4. L *Labor:* A labor representative or employee concerned with safety in the workplace.
5. RT *Applied Research/Testing Laboratory:* A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.
6. E *Enforcing Authority:* A representative of an agency or an organization that promulgates and/or enforces standards.
7. I *Insurance:* A representative of an insurance company, broker, agent, bureau, or inspection agency.
8. C *Consumer:* A person who is or represents the ultimate purchaser of a product, system, or service affected by the standard, but who is not included in (2).
9. SE *Special Expert:* A person not representing (1) through (8) and who has special expertise in the scope of the standard or portion thereof.

NOTE 1: "Standard" connotes code, standard, recommended practice, or guide.

NOTE 2: A representative includes an employee.

NOTE 3: While these classifications will be used by the Standards Council to achieve a balance for Technical Committees, the Standards Council may determine that new classifications of member or unique interests need representation in order to foster the best possible Committee deliberations on any project. In this connection, the Standards Council may make such appointments as it deems appropriate in the public interest, such as the classification of "Utilities" in the National Electrical Code Committee.

NOTE 4: Representatives of subsidiaries of any group are generally considered to have the same classification as the parent organization.

Submitting Public Input / Public Comment Through the Online Submission System

Soon after the current edition is published, a Standard is open for Public Input.

Before accessing the Online Submission System, you must first sign in at www.nfpa.org. *Note: You will be asked to sign-in or create a free online account with NFPA before using this system:*

a. Click on Sign In at the upper right side of the page.
b. Under the Codes and Standards heading, click on the "List of NFPA Codes & Standards," and then select your document from the list or use one of the search features.

OR

a. Go directly to your specific document information page by typing the convenient shortcut link of www.nfpa.org/document# (Example: NFPA 921 would be www.nfpa.org/921). Sign in at the upper right side of the page.

To begin your Public Input, select the link "The next edition of this standard is now open for Public Input" located on the About tab, Current & Prior Editions tab, and the Next Edition tab. Alternatively, the Next Edition tab includes a link to Submit Public Input online.

At this point, the NFPA Standards Development Site will open showing details for the document you have selected. This "Document Home" page site includes an explanatory introduction, information on the current document phase and closing date, a left-hand navigation panel that includes useful links, a document Table of Contents, and icons at the top you can click for Help when using the site. The Help icons and navigation panel will be visible except when you are actually in the process of creating a Public Input.

Once the First Draft Report becomes available there is a Public Comment period during which anyone may submit a Public Comment on the First Draft. Any objections or further related changes to the content of the First Draft must be submitted at the Comment stage.

To submit a Public Comment you may access the online submission system utilizing the same steps as previously explained for the submission of Public Input.

For further information on submitting public input and public comments, go to: http://www.nfpa.org/publicinput.

Other Resources Available on the Document Information Pages

About tab: View general document and subject-related information.

Current & Prior Editions tab: Research current and previous edition information on a Standard.

Next Edition tab: Follow the committee's progress in the processing of a Standard in its next revision cycle.

Technical Committee tab: View current committee member rosters or apply to a committee.

Technical Questions tab: For members and Public Sector Officials/AHJs to submit questions about codes and standards to NFPA staff. Our Technical Questions Service provides a convenient way to receive timely and consistent technical assistance when you need to know more about NFPA codes and standards relevant to your work. Responses are provided by NFPA staff on an informal basis.

Products & Training tab: List of NFPA's publications and training available for purchase.

Information on the NFPA Standards Development Process

I. Applicable Regulations. The primary rules governing the processing of NFPA standards (codes, standards, recommended practices, and guides) are the NFPA *Regulations Governing the Development of NFPA Standards (Regs).* Other applicable rules include NFPA *Bylaws*, NFPA *Technical Meeting Convention Rules*, NFPA *Guide for the Conduct of Participants in the NFPA Standards Development Process*, and the NFPA *Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council.* Most of these rules and regulations are contained in the *NFPA Standards Directory.* For copies of the *Directory*, contact Codes and Standards Administration at NFPA Headquarters; all these documents are also available on the NFPA website at "www.nfpa.org."

The following is general information on the NFPA process. All participants, however, should refer to the actual rules and regulations for a full understanding of this process and for the criteria that govern participation.

II. Technical Committee Report. The Technical Committee Report is defined as "the Report of the responsible Committee(s), in accordance with the Regulations, in preparation of a new or revised NFPA Standard." The Technical Committee Report is in two parts and consists of the First Draft Report and the Second Draft Report. (See *Regs* at Section 1.4.)

III. Step 1: First Draft Report. The First Draft Report is defined as "Part one of the Technical Committee Report, which documents the Input Stage." The First Draft Report consists of the First Draft, Public Input, Committee Input, Committee and Correlating Committee Statements, Correlating Notes, and Ballot Statements. (See *Regs* at 4.2.5.2 and Section 4.3.) Any objection to an action in the First Draft Report must be raised through the filing of an appropriate Comment for consideration in the Second Draft Report or the objection will be considered resolved. [See *Regs* at 4.3.1(b).]

IV. Step 2: Second Draft Report. The Second Draft Report is defined as "Part two of the Technical Committee Report, which documents the Comment Stage." The Second Draft Report consists of the Second Draft, Public Comments with corresponding Committee Actions and Committee Statements, Correlating Notes and their respective Committee Statements, Committee Comments, Correlating Revisions, and Ballot Statements. (See *Regs* at 4.2.5.2 and Section 4.4.) The First Draft Report and the Second Draft Report together constitute the Technical Committee Report. Any outstanding objection following the Second Draft Report must be raised through an appropriate Amending Motion at the NFPA Technical Meeting or the objection will be considered resolved. [See *Regs* at 4.4.1(b).]

V. Step 3a: Action at NFPA Technical Meeting. Following the publication of the Second Draft Report, there is a period during which those wishing to make proper Amending Motions on the Technical Committee Reports must signal their intention by submitting a Notice of Intent to Make a Motion (NITMAM). (See *Regs* at 4.5.2.) Standards that receive notice of proper Amending Motions (Certified Amending Motions) will be presented for action at the annual June NFPA Technical Meeting. At the meeting, the NFPA membership can consider and act on these Certified Amending Motions as well as Follow-up Amending Motions, that is, motions that become necessary as a result of a previous successful Amending Motion. (See 4.5.3.2 through 4.5.3.6 and Table 1, Columns 1-3 of *Regs* for a summary of the available Amending Motions and who may make them.) Any outstanding objection following action at an NFPA Technical Meeting (and any further Technical Committee consideration following successful Amending Motions, see *Regs* at 4.5.3.7 through 4.6.5.3) must be raised through an appeal to the Standards Council or it will be considered to be resolved.

VI. Step 3b: Documents Forwarded Directly to the Council. Where no NITMAM is received and certified in accordance with the Technical Meeting Convention Rules, the standard is forwarded directly to the Standards Council for action on issuance. Objections are deemed to be resolved for these documents. (See *Regs* at 4.5.2.5.)

VII. Step 4a: Council Appeals. Anyone can appeal to the Standards Council concerning procedural or substantive matters related to the development, content, or issuance of any document of the NFPA or on matters within the purview of the authority of the Council, as established by the Bylaws and as determined by the Board of Directors. Such appeals must be in written form and filed with the Secretary of the Standards Council (see *Regs* at Section 1.6). Time constraints for filing an appeal must be in accordance with 1.6.2 of the *Regs.* Objections are deemed to be resolved if not pursued at this level.

VIII. Step 4b: Document Issuance. The Standards Council is the issuer of all documents (see Article 8 of *Bylaws*). The Council acts on the issuance of a document presented for action at an NFPA Technical Meeting within 75 days from the date of the recommendation from the NFPA Technical Meeting, unless this period is extended by the Council (see *Regs* at 4.7.2). For documents forwarded directly to the Standards Council, the Council acts on the issuance of the document at its next scheduled meeting, or at such other meeting as the Council may determine (see *Regs* at 4.5.2.5 and 4.7.4).

IX. Petitions to the Board of Directors. The Standards Council has been delegated the responsibility for the administration of the codes and standards development process and the issuance of documents. However, where extraordinary circumstances requiring the intervention of the Board of Directors exist, the Board of Directors may take any action necessary to fulfill its obligations to preserve the integrity of the codes and standards development process and to protect the interests of the NFPA. The rules for petitioning the Board of Directors can be found in the *Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council* and in Section 1.7 of the *Regs.*

X. For More Information. The program for the NFPA Technical Meeting (as well as the NFPA website as information becomes available) should be consulted for the date on which each report scheduled for consideration at the meeting will be presented. To view the First Draft Report and Second Draft Report as well as information on NFPA rules and for up-to-date information on schedules and deadlines for processing NFPA documents, check the NFPA website (www.nfpa.org/docinfo) or contact NFPA Codes & Standards Administration at (617) 984-7246.

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EDUFIRE

ویدیو – انیمیشن های اطفا، اعلام حریق، تهویه وتخلیه دود (رایگان)

برای مشاهده هر یک از ویدیوهای زیر کافیست بر روی عنوان آن آموزش کلیک نمایید تا به صفحه ویدیو و آموزش آن عنوان هدایت شوید.

انیمیشن ویدیو

- اطفا حریق آبی
  - سیستم اطفا لوله خشک اسپرینکلر
  - سیستم اطفا لوله تر اسپرینکلر
  - سیستم اطفا پیش عملگر
  - سیستم اطفا واترمیست
  - سیستم اطفا سیلابی
- سیستم اطفا فوم
- تجهیزات اطفا حریق - تجهیزات هشدار دهنده
- تجهیزات اطفا حریق- اسپرینکلر
- سیستم اطفا آشپزخانه صنعتی
- سیستم اطفا آیروسل
- سیستم اطفا دستی
- سیستم اطفا گازی
  - سیستم اطفا FM200 , NOVEC, Inert Gas (IG)
  - سیستم اطفا CO_2
- سیستم تهویه و تخلیه دود
- سیستم اعلام حریق
  - آدرس‌پذیر
  - متعارف

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آموزش استاندارد

- آموزش استاندارد NFPA 13
- آموزش استاندارد NFPA 14
- آموزش استاندارد NFPA 20

آموزش نرم‌افزار

- اتواسپرینک
- پایروسیم
- پث‌فایندر

دانلود استاندارد

- ترجمه استاندارد NFPA 30,14,13,10
- تمامی استانداردهای NFPA & FM
- ترجمه استاندارد NFPA 1037

محصولات

- اتواسپرینک ۲۰۱۳ و ۲۰۱۹ به زبان فارسی برای اولین بار در ایران
- آلارم کد ۲۰۱۹ به زبان فارسی برای اولین بار در ایران
- اطفا حریق آبی
- پایپ‌نت (ماژول اسپرینکلر)
- کانتم
- اعلان حریق

دوره‌های حضوری

- آموزش اتواسپرینک
- آموزش آلارم‌کد
- آموزش پایروسیم
- آموزش کانتم + اگزاست
- آموزش اطفا آبی +پمپ + بازدید از کارگاه
- آموزش اطفا گازی
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- آموزش اعلام حریق متعارف
- دوره آمادگی آزمون آتش‌نشانی (برق، مکانیک، عمران، معماری)

تهران . خیابان سعدی شمالی .خیابان مرادی نور . پلاک ۳۱ . واحد ۱
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