NFPA 18

Standard on Wetting Agents

2006 Edition

NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

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NFPA 18

Standard on

Wetting Agents

2006 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 and acted on by NFPA at its June Association Technical Meeting held June 6–10, 2005, in Las Vegas, NV. It was issued by the Standards Council on July 29, 2005, with an effective date of August 18, 2005, and supersedes all previous editions.

This edition of NFPA 18 was approved as an American National Standard on August 18, 2005.

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 (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 was a reconfirmation. However, some editorial changes were incorporated in an effort to make the document more user-friendly.

The 2006 edition has undergone extensive revisions, both technical and editorial. Editorial changes include updating the structure of the standard to the *Manual of Style for NFPA Technical Committee Documents* and strengthening the language into specific requirements.

Technical changes include clarifying the definition of wetting agents and their use on specific types of fires. Specific requirements for wetting agents and the methods for testing have been detailed in Chapter 5. Chapter 6 contains requirements for the supply of wetting agents. Specific packaging requirements are found in Chapter 7, and inspection, testing, and maintenance requirements for systems using wetting agents are detailed in Chapter 8.

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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.

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NFPA 18

Standard on

Wetting Agents

2006 Edition

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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. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. 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 new methods or devices, provided sufficient technical data are submitted to the authority having jurisdiction to demonstrate that the new method or devices are equivalent in quality, effectiveness, durability, and safety to those prescribed by this standard.

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,* 2002 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* 2003 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection,* 2001 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2002 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus,* 2003 edition.

2.3 Other Publications.

2.3.1 ASTM Publications. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 97, *Standard Test Method for Pour Point of Petroleum Products,* 2004.

ASTM D 1331, *Standard Test Methods for Surface and Interfacial Tension of Solutions of Surface-Active Agents,* 2001.

ASTM G 1, *Standard Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens*, 2003.

ASTM G 31, *Standard Recommended Practice for Laboratory Immersion Corrosion Testing of Metals*, 1999.

2.3.2 ISO Publication. International Organization for Standardization, 1 rue de Varembe, Case postale 56, CH-1211 Geneva 20, Switzerland.

ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories,* 1999.

2.3.3 NACE Publication. NACE International, 1440 South Creek Drive, Houston, TX 77084-4906.

TM0169, *Standard Test Method for Laboratory Corrosion Testing of Metals*, 2003.

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

UL 162, *Standard for Foam Equipment and Liquid Concentrates*, 1994.

UL 711, *Rating and Testing of Fire Extinguishers*, 2002.

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2.3.5 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Title 40, Code of Federal Regulations, Part 160, "Good Laboratory Standard Practices."

Title 40, Code of Federal Regulations, Part 792, "Good Laboratory Standard Practices."

2.3.6 Other Publication. *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,* 2002 edition.
NFPA 306, *Standard for the Control of Gas Hazards on Vessels,* 2003 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. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions.

3.3.1 Class A Fire. A fire in ordinary combustible materials, such as wood, cloth, paper, rubber, and many plastics. [**10,** 2002]

3.3.2 Class B Fire. A fire in flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammable gases. [**10,** 2002]

3.3.3 Class C Fires. Fires that involve energized electrical equipment. [**10,** 2002]

3.3.4 Class D Fires. Fires in combustible metals, such as magnesium, titanium, zirconium, sodium, lithium, and potassium. [**10,** 2002]

3.3.5 Combustible Liquid. A liquid that has a closed-cup flash point at or above 37.8°C (100°F). [**306,** 2003]

3.3.6 Flammable Liquid. A liquid that has a closed-cup flash point that is below 37.8°C (100°F) and a maximum vapor pressure of 2068 mm Hg (40 psia) at 37.8°C (100°F).

3.3.7 Wetting Agent. A concentrate which, when added to water reduces the surface tension and increases its ability to penetrate and spread.

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

Chapter 4 Uses and Limitations

4.1 General.

4.1.1 Wetting agents for fire fighting shall be listed and shall be approved by the authority having jurisdiction.

4.1.2 Wetting agents shall only be mixed with water.

4.2 Limitations.

4.2.1 General. The use of a wetting agent solution shall be limited to those 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. 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 unless specifically listed for that purpose.

4.2.3.1* Fire extinguishers and fixed fire extinguishing systems using wetting agent solution(s) shall not be permitted for the extinguishment of fires in cooking appliances 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 Agents.

4.3.1 Wetting agents shall not be mixed with other wetting agents or additives.

4.3.2 Wetting agent solutions shall not be mixed with other wetting agent solutions or additive solutions.

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4.3.3 Wetting agent solutions generated separately shall be permitted to be applied to a fire in sequence or simultaneously.

4.4 Concentrations. Wetting agent solutions shall be used only in concentrations specified by their listing.

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

5.1 General.

5.1.1 Wetting agents and wetting agent solutions shall be tested in accordance with Sections 5.2 and 5.3.

5.1.2 The tests detailed in this chapter shall be conducted by an approved independent laboratory using laboratory practices in accordance with ISO/IEC 17025, 40 CFR 160, 40 CFR 792, 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 Agents.

5.2.1 Pour Point. The pour point shall be determined in accordance with ASTM D 97.

5.2.2 Miscibility.

5.2.2.1 The wetting agent shall be miscible in water at the manufacturer's minimum and maximum use concentrations.

5.2.2.2 The miscibility of the wetting agent shall be tested according to the following procedures so as to meet the conditions of Table 5.2.2.2:

(1) Five hundred (500) mL (16.9 oz) of deionized or distilled water at the test temperature shall be added to a 1 L (0.26 g) glass beaker.
(2) A stirrer, as illustrated in Figure 5.2.2.2, shall be inserted into the water to the depth shown in the figure.
(3) The speed of the stirrer motor shall be adjusted to 60 rpm ± 10 rpm.
(4) The required amount of wetting agent shall be added within 2 seconds.
(5) After 10 revolutions of the stirrer, rotation shall be stopped and the liquid mixture shall be observed.
(6) If the foam solution is not visually homogeneous, it shall be stirred for an additional 10 revolutions. Opalescence shall be considered to be homogeneous.
(7) The procedure shall be repeated until the solution is visually homogeneous or until the total number of revolutions is equal to 100.
(8) The observations made at each 10-revolution interval shall be recorded.
(9) If the solution is not visually homogeneous after 100 revolutions, the result shall be recorded as not miscible.

5.2.3* Separation.

5.2.3.1 Wetting agents shall not separate at temperatures of 0°C and 48.9°C (32°F and 120°F).

5.2.3.2 The separation test shall be conducted in a sealable, 100 cc transparent container.

5.2.3.3 The test shall be conducted for 30 days.

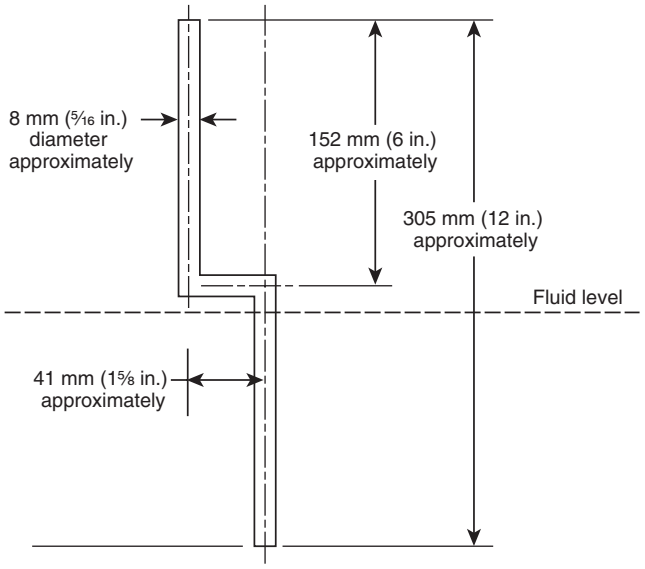

FIGURE 5.2.2.2 Stirrer Shaft for Miscibility Test.

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	40 ± 2	21 ± 1	70 ± 2
21 ± 1	70 ± 2	21 ± 1	70 ± 2
4 ± 1	40 ± 2	4 ± 1	40 ± 2
21 ± 1	70 ± 2	4 ± 1	40 ± 2

5.2.3.4 No visible separation, stratification, or precipitation shall occur during the course of the test.

5.2.4 Impact of Low Temperature on Surface Tension.

5.2.4.1 Surface tension of wetting agent solution prepared from wetting agents stored at –18°C (0°F) shall not vary more than 5 dynes/cm from the initial measurement determined in accordance with 5.3.1.

5.2.4.2 For 16 hours, 100 cc of the wetting agent shall be placed in a clean closed container and conditioned at –18°C (0°F).

5.2.4.3 The cooled wetting agent shall be conditioned at 18°C ± 2.7°C (65°F ± 5°F) for not less than 16 hours.

5.2.4.4 A wetting agent solution shall be prepared from the conditioned wetting agent at the manufacturer's minimum and maximum use concentrations.

5.2.4.5 The surface tension of the wetting agent solution shall be measured.

5.2.5* pH. The pH of the wetting agent shall be between 6 and 9 at 18°C ± 2.7°C (65°F ± 5°F).

5.2.6 Viscosity.

5.2.6.1 The results of viscosity testing shall be reported in terms of absolute viscosity (centipoise).

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5.2.6.2 Viscosity determinations shall be made at 18°C ± 2.7°C (65°F ± 5°F) in accordance with 5.2.6.3.

5.2.6.3 The viscosity of the wetting agent shall be measured at the temperatures of 2°C (35°F), 21°C (70°F), and 49°C (120°F) according to the following:

(1) A Brookfield viscometer, model LVT or LVF, 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 oz) of the test sample shall be positioned under the viscometer.
(3) The spindle shall be immersed in the concentrate to the indicated depth.
(4) The viscometer then shall be turned on, and the spindle shall be allowed to rotate for 1 minute prior to taking the measurement.
(5) Triplicate measurements shall be made, stirring gently between each measurement, and the viscosity of the sample shall be calculated in centipoise, using the applicable multiplier (5 for spindle No. 2 and 100 for spindle No. 4).

5.2.7 Toxicity.

5.2.7.1* Wetting agents shall comply with the following EPA OPPTS tests or their equivalent:

(1) 870.1100 Acute Oral Toxicity
(2) 870.1200 Acute Dermal Toxicity
(3) 870.2400 Acute Eye Irritation
(4) 870.2500 Acute Dermal Irritation

5.2.7.2 The wetting agent and the maximum use solution shall not exceed the toxicity limits established in Table 5.2.7.2 when tested in accordance with 5.2.7.1.

5.2.8* Corrosion. Testing of the corrosive effects of wetting agent solutions shall be conducted in accordance with either NACE Standard Test Method TM0169, or ASTM G 1 and ASTM G 31, and in accordance with 5.2.8.2 through 5.2.8.7.

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

5.2.8.2 Samples. The wetting agent and its solutions shall be tested for corrosion with samples of 4130 mild steel, 2024-T3 aluminum, and UNS C27000 yellow brass (65 percent copper, 35 percent zinc).

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

5.2.8.3 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).

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

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

5.2.8.4.2 Procedure for Cleaning.

5.2.8.4.2.1 The coupons shall be cleaned chemically as described in Table 5.2.8.4.2.1, rinsed in distilled water, wiped to remove the water film, and dried at 55°C (130°F) for 15 to 30 minutes.

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

5.2.8.4.3 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.

5.2.8.5 Test Set-Up. 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.

5.2.8.5.1 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.

Table 5.2.7.2 Toxicity Limits for Wetting Agents and Wetting Agent Solutions

	Acute Oral Toxicity	Acute Dermal Toxicity	Primary Dermal Irritation	Primary Eye 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, recommend protective gear and safe handling procedures	If LD_{50} ≥200 but ≤2000, recommend protective gear and safe handling procedures	If more irritating, recommend protective gear and safe handling procedures	If more irritating, recommend protective gear and safe handling procedures	If more irritating, recommend protective gear and safe handling procedures
	LD_{50} < 50 is not acceptable.	LD_{50} < 200 is 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

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Table 5.2.8.4.2.1 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 conc 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†

* Cleaning solutions should be discarded as they become used or discolored. If in doubt, they should be replaced. When cleaning exposed coupons, special care is needed to prevent erroneous result, and, in the case of magnesium solution, fresh chemical should be used for each coupon.
† A rubber stopper, Scotch Brite or equivalent, nonmetallic scourer, or scrubber is permitted to be used to scrub coupons with hard or severe coating.

5.2.8.5.2 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.

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

5.2.8.5.4 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), dependent on the desired test condition.

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

5.2.8.6.1 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.

5.2.8.6.2 The coupons shall be lightly scrubbed with a toothbrush or other nonmetallic brush to aid in removal of scale.

5.2.8.6.3 The coupons shall be cleaned chemically using the same procedures that were used initially in accordance with Table 5.2.8.4.2.1.

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

5.2.8.6.5 After rinsing in distilled water, oven-drying, and cooling the final weight of each coupon shall be determined to 0.1 mg (0.00154 grain).

5.2.8.7 Corrosion Weight.

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

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

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)
p = density of the alloy [g/cm^3 ($lb/in.^3$)] as follows:
4130 Steel = 7.86 g/cm^3 (0.28 $lb/in.^3$)
Yellow brass = 8.53 g/cm^3 (0.3 $lb/in.^3$)
2024-T3 Aluminum = 2.77 g/cm^3 (0.1 $lb/in.^3$)

5.2.8.7.2 Results of replicate tests shall be averaged.

5.3 Wetting Agent Solutions.

5.3.1 Surface Tension. Wetting agents when added to water in concentrations specified for use shall reduce the surface tension to less than 33 dynes/cm when tested at 18°C (65°F) prepared from wetting agent as received from the manufacturer shall be determined in accordance with ASTM D 1331.

5.3.2 Separation on Standing.

5.3.2.1 The wetting agent solution, in concentrations specified for use by the manufacturer, shall display no tendency to stratify or otherwise separate when standing for 30 days at the minimum and maximum storage temperatures and at 18°C ± 2.7°C (65°F ± 5°F).

5.3.2.2 The formation of two or more distinct layers or precipitation occurring during the course of the test shall be considered as an indication of separation.

5.3.3* Corrosion.

5.3.3.1 Testing of the corrosive effects of wetting agents solutions shall be conducted in accordance with 5.2.8 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.

5.3.4 Class A Fire Extinguishment Tests.

5.3.4.1 Wood Crib Test.

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5.3.4.1.1 Wetting agent solutions at the concentrations specified by the manufacturer shall be evaluated to, and comply with, the requirements of UL 711 for Class A fires utilizing a 3A wood crib.

5.3.4.1.2 The test shall be conducted utilizing a 9.5 L (2.5 gal) listed 2A rated water extinguisher.

5.3.4.2 Deep-Seated Fire Test.

5.3.4.2.1 Wetting agent solutions shall extinguish deep-seated cotton fires and exhibit less runoff than water when tested in accordance with 5.3.4.2.2 and 5.3.4.2.3.

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

5.3.4.2.3 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 (1⅜ in.) in diameter and 33 mm (1$^{5}/_{16}$ 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 cc 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.

5.3.4.3 Wood Fiber Board Penetration.

5.3.4.3.1 Wetting agent solutions shall extinguish wood fiber board fires and exhibit less runoff and weight loss than water when tested in accordance with 5.3.4.3.2 and 5.3.4.3.3.

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

5.3.4.3.3 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 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 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.

5.3.5* Class B Fire Extinguishment Tests.

5.3.5.1 Wetting agent solutions at the concentrations specified by the manufacturer shall be evaluated to and comply with the requirements of UL 711 for Class B fires.

5.3.5.2 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 UL 711 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 on to 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.

5.3.5.3 Extinguishment shall be achieved in two consecutive tests.

Chapter 6 Requirements for Supply of Wetting Agent

6.1 System Requirements.

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

6.2 Fire Department Supply Requirements.

6.2.1 Tanks.

6.2.1.1 The manufacturer of the wetting agent shall specify if premixing is allowed.

6.2.2* 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, the amount considered necessary shall be carried in a tank connected to proportioning equipment on the apparatus installed in accordance with NFPA 1901.

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

(1) NFPA 13
(2) NFPA 14
(3) NFPA 15

Chapter 7 Packaging and Labeling

7.1 Packaging.

7.1.1* Regulations. Packaging of water additive concentrates shall conform with regulations governing ground and air transport of materials.

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7.1.2 Container Test. Containers shall comply with the accelerated storage test in UL 162 Section 22 using the wetting agent.

7.2 Storage.

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

7.2.2 No wetting agent shall be stored at a temperature below 0°C (32°F).

7.3 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 8 Inspection, Testing, and Maintenance of Fixed Systems

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

8.2 Inspection of Wetting Agent. Annually, samples of wetting agents 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 will increase 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 will depend on utilizing the most efficient application methods, techniques, and devices for the hazard involved.

When water containing listed wetting agents 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.3.3.8 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.4.2.3.1 Fire test requirements for protection of commercial cooking equipment are addressed by UL 300 for fixed systems and UL 711 for fire extinguishers.

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

A.4.3 The mixing of these agents can have adverse effects and render solutions or systems ineffective for fire extinguishment.

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 Nuoy Tensiometer, and the proper correction factor applied to the determined values.

A.5.2.5 The pH of aqueous solutions of wetting agents is a measure of the acidity and alkalinity of the solution. Variations substantially below 7 or above 12 can either result in a serious

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increase in corrosion rate or have material effect on its value in fire protection and fire extinguishment.

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 There are other organizations, such as the Organization for Economic Cooperation and Development (OECD), having similar tests that can be substituted with the approval of the authority having jurisdiction.

A.5.2.8 For continuous storage, 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.5.3.3 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.5.3.5 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 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.6.1.1 The method whereby the wetting agent is added to water is not herein specifically set forth. The solution can be premixed in tanks or can result from bringing the wetting agent into contact with water by any suitable proportioning device, providing said device is approved in accordance with applicable standards.

A.6.2.2 Where such equipment is also used to take suction from a hydrant supplied by potable water, extra care should be exercised to prevent contamination of such potable water supplies with the wetting agent.

A.6.3 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 high absorption ability of the wetting agent solution
(2) The possibility of increased floor loads due to the retention of large volumes of wetting agent solution
(3) The potential for contaminating the public water supply when supplying a fixed system 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.7.1.1 Water additive containers should conform to the United Nations Performance Based Packaging Standards as codified under U.S. Department of Transportation Regulations, 49 CFR 178.600.

A.8.1 Due to its greater penetrating power, wetting agent solution is capable of passing through small openings that would be impassable to water. For this reason it will often be found that old, but apparently sound, equipment will have 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 Publication. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 11, *Standard for Low-, Medium-, and High-Expansion Foam*, 2005 edition.

B.1.2 Other Publications.

B.1.2.1 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 300, *Standard for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas,* 1996.

UL 711, *Rating and Testing of Fire Extinguishers,* 2004.

B.1.2.2 U.S. Government Publication. U.S. Government Printing Office, Washington, DC 20402.

Title 49, Code of Federal Regulations, Part 178.600.

B.2 Informational References. (Reserved)

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

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Call goes out for proposals to amend existing document or for recommendations on new document.

▼

Committee meets to act on proposals, to develop its own proposals, and to prepare its report.

▼

Committee votes on proposals by letter ballot. If two-thirds approve, report goes forward. Lacking two-thirds approval, report returns to committee.

▼

Report — *Report on Proposals* (ROP) — is published for public review and comment.

▼

Committee meets to act on each public comment received.

▼

Committee votes on comments by letter ballot. If two-thirds approve, supplementary report goes forward. Lacking two-thirds approval, supplementary report returns to committee.

▼

Supplementary report — *Report on Comments* (ROC) — is published for public review.

▼

NFPA membership meets (Annual or Fall Meeting) and acts on committee report (ROP or ROC).

▼

Committee votes on any amendments to report approved at NFPA Annual or Fall Meeting.

▼

Appeals to Standards Council on Association action must be filed within 20 days of the NFPA Annual or Fall Meeting.

▼

Standards Council decides, based on all evidence, whether or not to issue standard or to take other action, including upholding any appeals.

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

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U *User:* A representative of an entity that is subject to the provisions of the standard or that voluntarily uses the standard.

I/M *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.

L *Labor:* A labor representative or employee concerned with safety in the workplace.

R/T *Applied Research/Testing Laboratory:* A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.

E *Enforcing Authority:* A representative of an agency or an organization that promulgates and/or enforces standards.

I *Insurance:* A representative of an insurance company, broker, agent, bureau, or inspection agency.

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 the *User* classification.

SE *Special Expert:* A person not representing any of the previous classifications, but who has a special expertise in the scope of the standard or portion thereof.

NOTES:

1. "Standard" connotes code, standard, recommended practice, or guide.
2. A representative includes an employee.
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1. **a) NFPA Document Title** National Fire Alarm Code
   b) NFPA No. & Edition NFPA 72, 2002 ed. **c) Section/Paragraph** 4.4.7.1.1

2. **Proposal Recommends:** *(check one)* ☐ **new text** ☐ **revised text** ☒ **deleted text**

3. **Proposal.** *(Include proposed new or revised wording, or identification of wording to be deleted.)* Note: Proposed text should be in legislative format, that is, use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~). Delete exception.

4. **Statement of Problem and Substantiation for Proposal.** Note: State the problem that will be resolved by your recommendation. Give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication. A properly installed and maintained system should be free of ground faults. The occurrence of one or more ground faults should be required to cause a "trouble" signal because it indicates a condition that could contribute to future malfunction of the system. Ground fault protection has been widely available on these systems for years and its cost is negligible. Requiring it on all systems will promote better installations, maintenance and reliability.

5. ☒ **This Proposal is Original Material.** Note: Original material is considered to be the submitter's own idea based on or as a result of his/her own experience, thought, or research and, to the best of his/her knowledge, is not copied from another source.

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