NFPA® 18

Standard on Wetting Agents

2011 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

2011 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 7–10, 2010, in Las Vegas, NV. It was issued by the Standards Council on August 5, 2010, with an effective date of August 25, 2010, and supersedes all previous editions.

This edition of NFPA 18 was approved as an American National Standard on August 25, 2010.

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 has undergone extensive technical and editorial revision. Technical changes include limits for aquatic toxicity for parity and consistency with other product standards. Editorial changes include updating the structure of the standard to further 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.

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NFPA 18

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

Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet (•) between the paragraphs that remain.

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,* 2010 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* 2010 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection,* 2007 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2011 edition.

NFPA 1150, *Standard on Foam Chemicals for Fires in Class A Fuels,* 2010 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus,* 2009 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 D 97, *Standard Test Method for Pour Point of Petroleum Products,* 2007.

ASTM D 323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method),* 2008.

ASTM D 1293, *Standard Test Methods for pH of Water,* 1999 (2005).

ASTM D 1331, *Standard Test Methods for Surface and Interfacial Tension of Solutions of Surface-Active Agents,* 1989, Reapproved 2001.

ASTM D 2196, *Standard Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield type) Viscometer,* 2005.

ASTM E 729, *Standard Guide for Conducting Acute Toxicity Tests on Test Materials with Fishes, Macroinvertebrates, and Amphibians,* 1996 (2000).

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

ASTM G 31, *Standard Practice for Laboratory Immersion Corrosion Testing of Metals,* 1972, Reapproved 2004.

2.3.2 ISO Publications. 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*, 2005.

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

TM0169, *Standard Test Method for Laboratory Corrosion Testing of Metals*, Reaffirmed 2000.

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, revised 1999.

UL 711/ULC S508, *Rating and Fire Testing of Fire Extinguishers*, 2004, revised 2007.

2.3.5 U.S. EPA Publications. U.S. Environmental Protection Agency, National Service Center for Environmental Publications (NSCEP), P.O. Box 42419, Cincinnati, OH 45242.

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.

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

Title 40, Code of Federal Regulations, Part 160, "Good Laboratory Practice Standards," 2007.

Title 40, Code of Federal Regulations, Part 792, "Good Laboratory Practice Standards," 2007.

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*, 2010 edition.
NFPA 30, *Flammable and Combustible Liquids Code*, 2008 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 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 100°F (37.8°C), 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,** 2008]

3.3.7 Flammable Liquid. Any liquid that has a closed-cup flash point below 100°F (37.8°C), 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 100°F (37.8°C), as determined by ASTM D 323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)*. Flammable liquids are classified according to Section 4.3 of NFPA 30. [**30**, 2008]

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 at the prescribed proportion(s), 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 solutions shall be used only in concentrations specified by their listing.

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.

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 If $LD_{50} \geq 50$ but ≤ 500, protective gear and safe handling procedures recommended LD_{50} < 50 not acceptable	LD_{50} > 2000 mg/kg If $LD_{50} \geq 200$ but ≤ 2000, protective gear and safe handling procedures recommended LD_{50} < 200 not acceptable	Primary irritation score: <5.0 If more irritating, protective gear and safe handling procedures recommended	Mildly irritating or less If more irritating, protective gear and safe handling procedures recommended	Mildly irritating or less If more irritating, protective gear and safe handling procedures recommended
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

4.5.1.2 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 E 729.

4.5.1.2.2 Status conditions in ASTM soft water as described in ASTM E 729 at 12°C ± 1°C (54°F ± 2°F) shall be maintained throughout the 96-hour test period.

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 D 97.

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.).

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

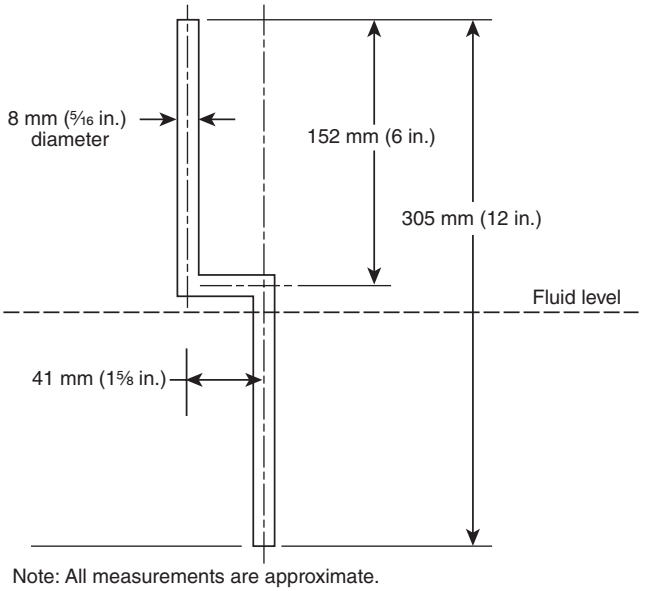

FIGURE 5.2.2.2 Stirrer Shaft for Miscibility Test.

(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.

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 D 1331.

5.2.5* Wetting Agent Concentrate pH. When tested in accordance with ASTM D 1293, 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 D 2196, 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 Wetting Agent Concentrate and Solution Toxicity.

5.2.7.1* Mammalian Toxicity.

5.2.7.1.1 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

5.2.7.1.2 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 5.2.7.1.1.

5.2.7.2 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 E 729.
(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).

5.2.7.3* 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.

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

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

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

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

5.2.8* 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 G 1 and ASTM G 31 and in accordance with 5.2.8.2 through 5.2.8.7.

5.2.8.1 Results. Results of the average of replicate tests shall be less than or equal to the values found in Table 5.2.8.1. 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.

Table 5.2.8.1 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 5.2.8.4.2.1 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 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.

5.2.8.4.3 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 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.

5.2.8.5.1 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.

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), depending 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 scrubbed with a toothbrush, nonmetallic scouring pad, or other nonmetallic brush to aid in removal of scale.

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 UL 711/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 UL 711/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
(2) NFPA 14
(3) NFPA 15

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 UL 162, and nonmetallic containers shall comply with the accelerated storage test in Section 22.3 of 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 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 UL 711/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 Nuoy 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 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.5.2.7.3 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.5.2.8 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.5.2.8.2 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.5.3.3 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 hydrant supplied by potable water, 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*, 2010 edition.

NFPA 11, *Standard for Low-, Medium-, and High-Expansion Foam*, 2010 edition.

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 2009 edition.

NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*, 2009 edition.

NFPA 1150, *Standard on Foam Chemicals for Fires in Class A Fuels*, 2010 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 Commercial Cooking Equipment,* 2005.

UL 711/ULC S508, *Rating and Testing of Fire Extinguishers,* 2004, revised 2007.

B.1.2.2 U.S. EPA Publications. U.S. Environmental Protection Agency, National Service Center for Environmental Publications (NSCEP), P.O. Box 42419, Cincinnati, OH 45242.

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

B.1.2.3 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Title 49, Code of Federal Regulations, Part 178, Subpart M, "Testing of Non-bulk Packagings and Packages," 2007.

B.2 Informational References. (Reserved)

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

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Sequence of Events Leading to Issuance of an NFPA Committee Document

Step 1: Call for Proposals

- Proposed new Document or new edition of an existing Document is entered into one of two yearly revision cycles, and a Call for Proposals is published.

Step 2: Report on Proposals (ROP)

- Committee meets to act on Proposals, to develop its own Proposals, and to prepare its Report.
- Committee votes by written ballot on Proposals. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Proposals (ROP) is published for public review and comment.

Step 3: Report on Comments (ROC)

- Committee meets to act on Public Comments to develop its own Comments, and to prepare its report.
- Committee votes by written ballot on Comments. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Comments (ROC) is published for public review.

Step 4: Technical Report Session

- "*Notices of intent to make a motion"* are filed, are reviewed, and valid motions are certified for presentation at the Technical Report Session. ("Consent Documents" that have no certified motions bypass the Technical Report Session and proceed to the Standards Council for issuance.)
- NFPA membership meets each June at the Annual Meeting Technical Report Session and acts on Technical Committee Reports (ROP and ROC) for Documents with "certified amending motions."
- Committee(s) vote on any amendments to Report approved at NFPA Annual Membership Meeting.

Step 5: Standards Council Issuance

- Notification of intent to file an appeal to the Standards Council on Association action must be filed within 20 days of the NFPA Annual Membership Meeting.
- Standards Council decides, based on all evidence, whether or not to issue Document or to take other action, including hearing any appeals.

Committee Membership Classifications

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

M *Manufacturer:* A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.

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.
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 members 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 appointments as it deems appropriate in the public interest, such as the classification of "Utilities" in the National Electrical Code Committee.
4. Representatives of subsidiaries of any group are generally considered to have the same classification as the parent organization.

NFPA Document Proposal Form

NOTE: All Proposals must be received by 5:00 pm EST/EDST on the published Proposal Closing Date.

For further information on the standards-making process, please contact the Codes and Standards Administration at 617-984-7249 or visit www.nfpa.org/codes.

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Please indicate in which format you wish to receive your ROP/ROC ☐ **electronic** ☐ **paper** ☒ **download**
(Note: If choosing the download option, you must view the ROP/ROC from our website; no copy will be sent to you.)

Date April 1, 200X **Name** John J. Doe **Tel. No.** 716-555-1234

Company Air Canada Pilot's Association **Email**

Street Address 123 Summer Street Lane **City** Lewiston **State** NY **Zip** 14092

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1. (a) NFPA Document Title National Fuel Gas Code **NFPA No. & Year** 54, 200X Edition

(b) Section/Paragraph 3.3

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; i.e., use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~).]

Revise definition of effective ground-fault current path to read:

3.3.78 Effective Ground-Fault Current Path. An intentionally constructed, permanent, low impedance electrically conductive path designed and intended to carry ~~underground~~ electric fault current ~~conditions~~ from the point of a ground fault on a wiring system to the electrical supply source.

4. Statement of Problem and Substantiation for Proposal: (Note: State the problem that would 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.)

Change uses proper electrical terms.

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6/09-B

SAMPLE

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Please indicate in which format you wish to receive your ROP/ROC ☐ electronic ☐ paper ☐ download
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1. (a) NFPA Document Title _____ **NFPA No. & Year** _____

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