

NFPA® 1150

Standard on
Foam Chemicals for
Fires in Class A Fuels

2010 Edition



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

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NFPA® 1150

Standard on

Foam Chemicals for Fires in Class A Fuels

2010 Edition

This edition of NFPA 1150, *Standard on Foam Chemicals for Fires in Class A Fuels*, was prepared by the Technical Committee on Forest and Rural Fire Protection. It was issued by the Standards Council on October 27, 2009, with an effective date of December 5, 2009, and supersedes all previous editions.

This edition of NFPA 1150 was approved as an American National Standard on December 5, 2009.

Origin and Development of NFPA 1150

The first edition of this document was issued in 1989 as NFPA 298, *Standard on Foam Chemicals for Wildland Fire Control*, in response to a perceived need for a performance standard dealing with the foam chemicals being used in controlling wildland fires. The 1994 edition was a complete revision to make the document consistent with the developing changes in Class A foam technology. The title was changed to *Standard on Fire Fighting Foam Chemicals for Class A Fuels in Rural, Suburban, and Vegetated Areas*.

In 1999, the document was again revised to reflect further advancements in technology and a greater number of Class A concentrates and delivery systems available for use. The document was renumbered as NFPA 1150, which put it within the numerical grouping of documents under the responsibility of the Technical Committee on Forest and Rural Fire Protection.

The 2004 edition was a complete revision to bring the document into conformance with the *Manual of Style for NFPA Technical Committee Documents*. The title was changed to *Standard on Foam Chemicals for Fires in Class A Fuels* to recognize that these chemicals are being used not only in rural or wildland areas but in structural fire fighting and urban areas as well. The test procedures for the chemicals as well as the lists of materials tested for compatibility with the chemicals were updated to ensure the product is consistent with the needs of fire suppression personnel who are using the chemicals to control, suppress, or prevent fires in Class A fuels.

In the 2010 edition, an entirely new section has been added regarding exposure protection effectiveness of Class A foams. The standard now includes a test methodology involving lateral ignition flame spread on substrate treated with foam solutions. This important information will be useful for fire departments as well as manufacturers/producers of Class A foam products.



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Committee Scope: This Committee shall have primary responsibility for documents on fire protection for rural, suburban, forest, grass, brush, and tundra areas. This Committee shall also have primary responsibility for documents on Class A foam and water enhancing gels, and their utilization for all wildland and structural fire fighting. This excludes fixed fire protection systems.



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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.

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

Chapter 1 Administration

1.1* Scope. This standard specifies requirements for Class A foam and the chemicals used to produce Class A foam that is used to control, suppress, or prevent fires in Class A fuels.

1.2* Purpose.

1.2.1 The purpose of this standard is to define the acceptance requirements and test methods for fire-fighting foam chemicals that are used to control, suppress, or prevent fires in Class A fuels.

1.2.2 Acceptance requirements shall not be deemed as establishing performance levels in actual fire-fighting situations.

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. (Reserved)**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 92, *Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester*, 2002.

ASTM D 97, *Standard Test Method for Pour Point of Petroleum Products*, 2002.

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

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

ASTM D 2281, *Standard Test Method for Evaluation of Wetting Agents by the Skein Test*, 1997.

ASTM D 4976, *Standard Specification for Polyethylene Plastics Molding and Extrusion Materials*, 2002.

ASTM E 3, *Standard Practice for Preparation of Metallographic Specimens*, 2001.

ASTM E 407, *Standard Practice of Microetching Metals and Alloys*, 1999.

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

ASTM E 1321, *Standard Test Method for Determining Material Ignition and Flame Spread Properties*, 1997 (02).

2.3.2 ISO Publications. International Standards Organization, 1 rue de Varembe, Case Postale 56, CH-1211, Genève 20, Switzerland.

ISO 304, *Surface Active Agents — Determination of Surface Tension by Drawing Up Liquid Films*, 2nd edition, 1985.

ISO 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*,

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

NACE TM0169, *Standard Test Method — Laboratory Corrosion Testing of Metals*, 2000.

2.3.4 OECD Publications. Organization for Economic Cooperation and Development, 2, rue André-Pascal, 75775 Paris Cedex 16, France.

OECD Principles of Good Laboratory Practice, Annex 2, C(89)87(Final).

2.3.5 SAE Publications. Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

AMS-3208, *Chloroprene (Cr) Rubber, Weather Resistant*, 45-55, November 1998.

AMS-C-9084, *Cloth, Glass, Finished for Resin Laminates*, June 1999.

AMS-DTL-23053/5, *Insulation Sleaving, Electrical, Heat Shrinkable, Polyolefin, Flexible Crosslinked*, July 1999.

AMS-S-8802, *Sealing Compound, Temperature Resistant, Integral Fuel Tanks and Fuel Cell Cavities, High Adhesion*, January 2003.

2.3.6 U.S. EPA Publications. Environmental Protection Agency, National Service Center for Environmental Publications (NSCEP), P.O. Box 42419, Cincinnati, OH 45242. Also available at <http://www.epa.gov/ncepihom/nepishom/>.



OPPTS 835.3110, *Ready Biodegradability*, Section M, CO₂ 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, April 1996.

OPPTS 870.1100, *Acute Oral Toxicity*, Health Effects Test Guidelines, August 1998.

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

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

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

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

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

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

Federal Test Standard No. 601, Methods 3021 and 3025 (April 12, 1985).

Wildland Fire Chemicals Standard Test Procedures, STP-2.2, *Lateral Ignition and Flame Spread Test*, U.S.D.A. Forest Service, May 30, 2007.

2.3.8 U.S. Military Specifications. Standardization Documents Order Desk, Building 4D, 700 Robbins Ave., Philadelphia, PA 19111-5094. Also available at <http://stinet.dtic.mil/>.

MIL-A-A-55859A, *Tube, Nonmetallic; Polyvinyl Chloride (PVC) Flexible (General Use)*, October 31, 2002.

MIL-PRF-81733D, *Sealing and Coating Compound, Corrosion Inhibitive*, May 15, 1998.

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

2.4 References for Extracts in Mandatory Sections.

NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*, 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* 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.

3.2.2 Shall. Indicates a mandatory requirement.

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

3.2.4 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 Artificial Sea Water. A solution that consists of 1.10 percent magnesium chloride hexahydrate, 0.16 percent calcium chloride dihydrate, 0.40 percent anhydrous sodium sulfate, 2.50 percent sodium chloride, and 95.84 percent deionized or distilled water.

3.3.2 Biodegradability. A measure of the decomposition of organic matter through the action of microorganisms.

3.3.3 Class A Foam. Foam for use on fires in Class A fuels.

3.3.4 Class A Fuel. Materials such as vegetation, wood, cloth, paper, rubber, and some plastics in which combustion can occur at or below the surface of the material.

3.3.5 Drain Time. The time that it takes for a specified percent (customarily 25 percent) of the total solution that is contained in the foam to revert to liquid and drain out of the bubble structure.

3.3.6 Expansion Ratio. The ratio of the volume of the foam in its aerated state to the original volume of the non-aerated foam solution.

3.3.7 Exposure Protection Effectiveness. The ability of a product to increase the time to ignition of a substrate subjected to a prescribed radiant heat source.

3.3.8 Fixed Tank. A tank that is internal to or attached directly to a helicopter.

3.3.9 Flash Point. The minimum temperature of a liquid at which it gives off vapor sufficient to form an ignitable mixture with air near the surface of the liquid under specified environmental conditions.

3.3.10 Foam. An aggregation of bubbles lighter than water created by forcing or entraining air into a foam solution by means of suitably designed equipment or by cascading it through the air.

3.3.11 Foam Chemicals. A generic name for the liquid foam concentrate, foam solution, and foam in whatever form it is being used.

3.3.12* Foam Concentrate. The foaming agent as received from the supplier that, when mixed with water, becomes foam solution.

3.3.13 Foam Solution. A homogeneous mixture of foam concentrate and water in the mix ratio required to meet the needs of the user.

3.3.14 Intergranular Corrosion. A corrosive attack on metal at the grain boundary.

3.3.15* Laboratory Fresh Water. Deionized or distilled water to which calcium chloride has been added to provide a hardness measure of 120 to 140 ppm of calcium carbonate.

3.3.16 LC₅₀ (Lethal Concentration₅₀). The concentration of agent in water, usually expressed as milligrams of agent in a liter of solution, that results in the death of 50 percent of the aquatic test specimens within a specified time frame.

3.3.17 LD₅₀ (Lethal Dosage₅₀). The dosage of a chemical, usually expressed as milligrams of the chemical per kilogram of body weight of the test animal, at which 50 percent of the test animals die within a specified time frame.

3.3.18* Material Safety Data Sheet (MSDS). A form, provided by manufacturers and compounders (blenders) of chemicals, containing information about chemical composition, physical and chemical properties, health and safety hazards, emergency response, and waste disposal of the material. [472, 2008]

3.3.19 Miscibility. The ability of concentrate to mix with water under specified conditions without separation into phases.

3.3.20 Mix Ratio. The proportion of foam concentrate in the foam solution, expressed as a volume percentage.

3.3.21 Surface Tension. The elastic-like force at the surface of a liquid, which tends to minimize the surface area, causing drops to form.

3.3.22 Uniform Corrosion. Removal of metal by chemical means over the entire surface.

3.3.23 Viscosity. A measure of the resistance of a liquid to flow.

3.3.24 Wetting Ability. The ability of foam solution to penetrate and soak into a solid.

Chapter 4 Characteristics and Acceptance Requirements

4.1 General.

4.1.1* The characteristics, requirements, and handling of Class A foam concentrates, foam solutions, and foam shall be in accordance with this chapter.

4.1.2 A minimum of six 20-L or six 5-gal sealed containers of foam concentrate taken from a single production lot shall be used for the purpose of evaluating the foam concentrate properties and requirements of this standard.

4.1.2.1 The test product shall be identified by a unique product identifier, lot number, and production date.

4.1.2.2 Three of the containers shall be used for the stability test required in 4.2.2.1.

4.1.2.3 Three containers shall be used for evaluating the other properties and requirements of this standard.

4.2 Foam Concentrate.

4.2.1* Health, Safety, and Environmental Considerations.

4.2.1.1 Mammalian Toxicity. The foam concentrate shall not exceed the toxicity limits defined in Table 4.2.1.1 when tested in accordance with 5.3.1.

4.2.1.2 Aquatic Toxicity. The LC₅₀ of the foam concentrate shall be greater than 10 mg/L when tested in accordance with 5.3.2.

4.2.1.3 Biodegradability. The foam concentrate shall have a minimum of 60 percent biodegradation within 42 days when tested in accordance with 5.3.3.

4.2.1.4 Flash Point. The foam concentrate shall not exhibit a flash point below 60°C (140°F) when tested in accordance with 5.3.4.

4.2.2 Physical Properties.

4.2.2.1* Stability.

4.2.2.1.1 The foam concentrate shall not be stratified, crystallized, or otherwise separated when tested in accordance with 5.4.1.

4.2.2.1.2 The expansion ratio and drain time, as determined in accordance with 5.4.7, shall differ by no more than ±15 percent expansion ratio or ±2 minutes drain time when compared with the expansion ratio and drain time from fresh concentrate determined by Section 4.4.

4.2.2.2 Viscosity. The viscosity of the concentrate at temperatures of 2°C ± 1°C (35°F ± 2°F), 21°C ± 1°C (70°F ± 2°F), and 49°C ± 1°C (120°F ± 2°F) shall be measured as described in 5.4.2, and the viscosity values obtained shall be reported on the product data sheet.

4.2.2.3* Miscibility.

4.2.2.3.1 The foam concentrate shall be miscible in water at 21°C ± 1°C (70°F ± 2°F) when tested in accordance with 5.4.3, and the results shall be reported on the product data sheet.

4.2.2.3.2 The foam concentrate miscibility in water at 4°C ± 1°C (40°F ± 2°F) shall be determined in accordance with 5.4.3 and shall be reported on the product data sheet.

4.2.2.4* Pour Point. The pour point of the concentrate, when determined in accordance with 5.4.4, shall be less than 2°C (35°F) and shall be reported on the product data sheet.

4.2.3* Corrosion and Materials Compatibility.

4.2.3.1* Uniform Corrosion. The foam concentrate shall not exhibit values that exceed those specified in Table 4.2.3.1 when tested in accordance with 5.5.1.

4.2.3.2* Compatibility with Nonmetallic Materials.

4.2.3.2.1 The effects of foam concentrate on the hardness and volume of the nonmetallic materials listed in 4.2.3.2.2 shall be tested in accordance with 5.5.3.

4.2.3.2.2 The following nonmetallic materials shall be subject to testing:

- (1) PVC plastic, MIL-A-A-55859A, *Tube, Nonmetallic; Polyvinyl Chloride (PVC) Flexible (General Use)*
- (2) Sealant, AMS-S-8802, *Sealing Compound, Temperature Resistant, Integral Fuel Tanks and Fuel Cell Cavities, High Adhesion*
- (3) Sealant, MIL-PRF-81733D, *Sealing and Coating Compound, Corrosion Inhibitive*
- (4) Neoprene rubber, AMS-3208, *Chloroprene (Cr) Rubber, Weather Resistant, 45-55*
- (5) Fiberglass, AMS-C-9084, *Cloth, Glass, Finished for Resin Laminates*
- (6) High-density polyethylene, ASTM D 4976, *Standard Specification for Polyethylene Plastics Molding and Extrusion Materials*
- (7) Flexible polyolefin, AMS-DTL-23053/5, *Insulation Sleeving, Electrical, Heat Shrinkable, Polyolefin, Flexible Crosslinked*
- (8) Low-density polyethylene, ASTM D 4976, *Standard Specification for Polyethylene Plastics Molding and Extrusion Materials*

4.2.3.2.3 The hardness of the test piece shall not decrease by more than 10 percent or increase by more than 20 percent and shall be reported on the product data sheet.

4.2.3.2.4 The volume of the test piece shall not change by more than ±0.5 cm³ and shall be reported on the product data sheet.

