

NFPA 298

Standard on

Fire Fighting Foam

Chemicals for Class A

Fuels in Rural, Suburban,

and Vegetated Areas

1994 Edition



National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101



Documents

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The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

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Standard on

Fire Fighting Foam Chemicals for Class A Fuels in Rural, Suburban, and Vegetated Areas

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This edition of NFPA 298, *Standard on Fire Fighting Foam Chemicals for Class A Fuels in Rural, Suburban, and Vegetated Areas*, was prepared by the Technical Committee on Forest and Rural Fire Protection and acted on by the National Fire Protection Association, Inc., at its Annual Meeting held May 16–18, 1994, in San Francisco, CA. It was issued by the Standards Council on July 14, 1994, with an effective date of August 5, 1994, and supersedes all previous editions.

The 1994 edition of this document has been approved by the American National Standards Institute.

Origin and Development of NFPA 298

The first edition of NFPA 298 was developed by the Technical Committee on Forest and Rural Fire Protection in 1989 in response to a perceived need for a performance standard dealing with foam chemicals used in control of wildland fires. The 1994 edition is a complete revision, which was necessary to make the document consistent with the changes in Class A foam technology that have been developed since the 1989 edition was adopted.

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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 fire protection and prevention for rural and suburban areas and forest, grass, brush, and tundra areas.

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

Information on referenced publications can be found in Chapter 4 and Appendix B.

Chapter 1 Introduction

1-1 Scope. This standard specifies requirements and test procedures for foam chemicals used on Class A fuels.

1-2 Purpose.

1-2.1 The standard specifies requirements for foam chemicals that are used to help control fires in Class A fuels.

1-2.2 Tests are used to ensure compliance with the requirements of this standard. Tests shall not be deemed as establishing performance levels in actual fire-fighting situations.

1-3 Definitions.

Approved. Acceptable to the authority having jurisdiction.

NOTE: 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 concerned with product evaluations that is in a position to determine compliance with appropriate standards for the current production of listed items.

Authority Having Jurisdiction. The organization, office, or individual responsible for approving equipment, an installation, or a procedure.

NOTE: The phrase "authority having jurisdiction" 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.

Biodegradability. The decomposition of organic matter through the action of microorganisms, which results in the evolution of carbon dioxide.

Class A Foam.* An aggregation of bubbles having a lower density than water. The foam bubbles and the solution draining from them attach to and penetrate Class A fuels due to the reduced surface tension imparted to the water by the foam concentrate. The bubbles hold moisture and release it as the foam breaks down, prolonging the time the moisture can be absorbed by the fuels. The foam acts to exclude air from the fuel, envelopes the volatile combustible vapor and the fuel interfaces where applied in adequate quantities, and resists disruption due to wind, heat, and flame.

Class A Fuel. Combustibles such as vegetation, wood, cloth, paper, rubber, and many plastics.

Drain Time. The time that it takes for a specified portion of the total solution contained in the foam to revert to liquid and to drain out of the bubble structure.

Expansion. The ratio of the volume of the foam in its aerated state to the original volume of the nonaerated foam solution.

Foam. The aerated solution created by forcing or entraining air into a foam solution by means of suitably designed equipment or by cascading it through the air at a high velocity.

Foam Concentrate. The concentrated foaming agent as received by the manufacturer and approved by the authority having jurisdiction for use on Class A fuels.

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

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.

LC₅₀. The concentration (milligrams of test material per liter of solution) at which 50 percent of the test animals die.

LD₅₀. The dosage (milligrams of test material per kilogram of body weight) at which 50 percent of the test animals die.

Listed. Equipment or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which 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.

Shall. Indicates a mandatory requirement.

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

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

Use Level. The proportion of foam concentrate in the foam solution, expressed as a percentage. (Use levels for Class A foam solutions generally fall within the range of 0.1 percent to 1.0 percent.)

Water, Fresh. Deionized or distilled water to which 140 ppm of calcium, in the form of calcium chloride, have been added.

Water, Synthetic or Artificial Sea. A solution consisting of 1.10 percent magnesium chloride, 0.16 percent calcium chloride, 0.40 percent anhydrous sodium sulfate, 2.50 percent sodium chloride, and 95.84 percent deionized or distilled water. This composition meets Canadian General Standards Board Standard 28-GP-74M.

Chapter 2 Acceptance Criteria

2-1 Foam Concentrate.

2-1.1* Corrosion.

2-1.1.1 Uniform Corrosion. The foam concentrate shall not exhibit values exceeding those given in Table 2-1.1 when tested in accordance with 3-1.1.

2-1.1.2* Corrosion of Nonmetallic Materials. The effects of foam concentrate on the hardness and volume of the following nonmetallic materials shall be tested in accordance with 3-1.3. Tested materials shall not exhibit changes in hardness exceeding 10 percent nor changes in volume exceeding 5 percent.

- (a) PVC plastic
- (b) MIL-S-8802 sealant
- (c) MIL-S-81733 sealant
- (d) Neoprene rubber AMS (SAE Aerospace Materials Specification) 3208 synthetic rubber CL-Prene 45-55 share
- (e) Fiberglass with epoxy resin
- (f) Cross-linked polyethylene MIL-C-38359A
- (g) High density polyethylene MIL-P-51431A
- (h) Teflon AMS 3660
- (i) Flexible polyolefin MIL-I-23053/5.

2-1.2* Health and Safety.

2-1.2.1 Toxicity. The foam concentrate shall not exceed the toxicity limits defined in Table 2-1.2.1 when tested in accordance with Section 3-2 by a biological testing laboratory that is certified as adhering to good laboratory practice standards as defined in the *Code of Federal Regulations*, 40 CFR, Part 792 or Part 160.

2-1.2.1.1 Documentation. Upon request, the manufacturer shall provide a summary of the results of toxicity testing described in 2-1.2.1 and a copy of a current material safety data sheet.

2-1.3* Biodegradability. The foam concentrate shall be tested in accordance with Section 3-3. The concentrate shall be classified as readily biodegradable according to the *Code of Federal Regulations*, 40 CFR, Part 796.3100, as exemplified by a minimum of 60 percent biodegradation within 28 days.

2-1.3.1 Fish Toxicity. The foam concentrate shall be tested in accordance with Section 3-4. The LC_{50} shall be greater than 10 mg/L when measured after 96 hours of exposure.

2-1.4 Characteristics.

2-1.4.1* Temperature Stability. Foam concentrate shall be tested in accordance with Section 3-7. The foam concentrate shall not be stratified, crystallized, or otherwise separated at the end of the test. In addition, expansion and drain time shall be determined in accordance with Section 3-5, using foam solution prepared from the stored concentrate samples. The values for fresh and stored concentrates shall differ by no more than ± 15 percent expansion and ± 2 minutes drain time.

2-1.4.2 Viscosity. The viscosity of the concentrate shall be measured as described in Section 3-8, at temperatures of 0°, 35°, 70°, and 120°F (–18°, 2°, 21°, and 49°C). The viscosity values obtained shall be reported on the Product Data Sheet.

2-1.4.3 Miscibility. The miscibility of the foam concentrate shall be determined in accordance with Section 3-6 where mixing concentrate and water in the amounts required to prepare 0.3 and 1.0 percent foam solutions. The concentrate at 70°F (21°C) shall be miscible in water at 70°F (21°C). The miscibility of the concentrate in water at the additional temperatures included in Section 3-6 shall be reported on the additional Product Data Sheet.

2-1.4.4 Flash Point. The foam concentrate shall not exhibit a flash point below 140°F (60°C) when tested in accordance with Section 3-10.

2-1.5 Packaging and Labeling.

2.1.5.1 Packaging. Packaging of foam concentrates shall conform with regulations governing ground and air transport of materials. Containers shall meet performance oriented packaging criteria established and recommended by the United Nations as described in 4-1.3.

2-1.5.2 Labeling. In addition to other requirements that might apply, the manufacturer shall provide the following information on a label permanently attached to the concentrate container:

- (a) Manufacturer name and address
- (b) Product name, lot number, and date of manufacture
- (c) 25 percent drain time in deionized water as required in 2-3.1
- (d) Expansion in deionized water as required in 2-2.3.2
- (e) Manufacturer recommended use levels
- (f) Emergency and first aid instructions
- (g) Volume (U.S. gallons and liters) of concentrate in the container
- (h) Statement certifying that the product has been tested and meets all requirements of this standard.