

# NFPA® 1145

## Guide for the Use of Class A Foams in Manual Structural Fire Fighting

### 2011 Edition



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

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## NFPA® 1145

### Guide for the

## Use of Class A Foams in Manual Structural Fire Fighting

### 2011 Edition

This edition of NFPA 1145, *Guide for the Use of Class A Foams in Manual Structural Fire Fighting*, was prepared by the Technical Committee on Forest and Rural Fire Protection. It was issued by the Standards Council on June 1, 2010, with an effective date of June 21, 2010, and supersedes all previous editions.

This edition of NFPA 1145 was approved as an American National Standard on June 21, 2010.

### Origin and Development of NFPA 1145

At the request of the NFPA Standards Council in 1998, the Technical Committee on Forest and Rural Fire Protection developed NFPA 1145, *Guide for the Use of Class A Foams in Manual Structural Fire Fighting*, as a guide to assist fire departments and wildland fire agencies in the use of Class A foams for structural fire suppression and protection.

The Committee initially considered writing a standard on the application of Class A foam. However, because the use of Class A foam and its associated hardware and proportioning systems was still evolving, the Committee decided that a guide to the use of such foam would be of greater benefit to the many fire departments and agencies that were exploring the use of Class A foam for structural fire protection as well as fire suppression and extinguishment.

The second edition of NFPA 1145 reorganized the document in accordance with the *Manual of Style for NFPA Technical Committee Documents*, updated definitions as appropriate to use the preferred definition, and editorially updated and expanded the text to continue to make the document more useful to the reader. References to additional materials that could aid the reader in using Class A foam were also added.

The 2011 edition of NFPA 1145 includes additional references to research and guidance available from government and private sources, as well as updates to health and safety information for fire fighters.

This edition of NFPA 1145 is dedicated to the memory of long-time Technical Committee member John Bunting, who volunteered on several NFPA committees for over 30 years. With his determination to always provide the best advice for fire fighters in small and rural communities, the Technical Committee has developed its proposals and comments to improve this and other documents within its scope.



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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 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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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 advisory sections of this document are given in Chapter 2 and those for extracts in the 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 should 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.

**1.1.1** This document presents information for agencies planning to use Class A foam for structural fire fighting and protection. It presents information on foam properties and characteristics, proportioning and discharge hardware, application techniques, and safety considerations.

**1.1.2** This document describes the use and application of Class A foams that meet the requirements of NFPA 1150, *Standard on Foam Chemicals for Fires in Class A Fuels*.

**1.1.3** This document does not apply to the use of Class A foam in sprinkler systems or on fires involving Class B flammable or combustible liquids.

**1.1.4** This document is not written for applications of Class A foam in the wildland fire environment. However, much of the material in this guide can be helpful to those who use Class A foam in wildland fire applications. See Annex B for publications that address use of Class A foam in wildland applications.

**1.1.5** This document is not intended to discourage the use of emerging technologies and practices, provided that the recommended level of safety is not lessened.

**1.2 Purpose.** The primary purpose of this document is to present information on the safe and effective use of Class A foam for manual structural fire fighting and protection.

**1.3 Foreword.** Fire-fighting foam is a mass of air-filled bubbles formed by mixing air with a surfactant solution. Surfactant solutions are prepared by proportioning a foam concentrate with water. Fire-fighting foams have been designed for use on different fuel types. There are two broad categories of fire-fighting foam — Class A and Class B. Class B foams are designed for use on fires involving flammable and combustible liquids and are discussed in NFPA 11, *Standard for Low-, Medium-, and High-Expansion Foam*. Class A foams are best suited for use on fires involving ordinary combustibles (Class A fuels) and are not recommended for use on Class B fuels unless tested and listed for this purpose. Class A foams have a variety of expansion ratios. Low-expansion Class A foams are most often used in the applications discussed in this guide. Class A foam concentrates, when mixed with water at concentrations in the range of 0.1 to 1.0 percent by volume, produce an array of foam solutions and foams. Class A foam used in manual structural fire fighting is discussed in this guide.

**1.3.1** Although shown to be effective as early as the 1930s, fire-fighting foam was not generally used on Class A fuels until the mid 1980s. By that time, improvements in foam concentrate and application systems had progressed to the point where their use was practical and growing. Since that time, a number of effective Class A foam concentrates and an array of foam generation and application hardware have been developed and optimized. For more information on Class A foam and foam proportioning equipment, see NFPA 1150, *Standard on Foam Chemicals for Fires in Class A Fuels*, and NFPA 1901, *Standard for Automotive Fire Apparatus*. Fire apparatus using foam proportioners, aerating nozzles, and compressed air foam systems (CAFS) can use Class A foam concentrates to produce foam. Foam can also be applied aerially from water-scooping fixed- and rotary-wing aircraft. The resulting foams are effective on fires in the variety of fuels found in structure fires, wildland fires, and the rural/urban interface.

**1.3.2** Class A foams can be characterized by expansion ratio, drain time, and appearance. It is important to be able to identify the type of foam being produced based on the foam's appearance and to understand which type of foam is needed for a given fire situation. Wet and fluid foams contain more water per unit volume than drier foams and are consequently more effective in fire extinguishment. Drier foams containing less water per unit volume can be used for exposure protection due to their longer drain times and adhesion to vertical surfaces. Class A foams can have significantly different fire extinguishment and exposure protection capabilities, depending on their expansion ratio and drain time. Thus, the type and geometric arrangement of the fuel involved will determine which is the most effective type of foam.

**1.3.3** The effectiveness of Class A foam depends primarily on the amount of water that it brings into contact with the fuel/fire interface for insulating, cooling, or both. Aqueous solutions that contain low concentrations of the foam additive exhibit surface tensions less than half that of water alone. This reduction improves the penetrating capability of the solution, allowing a greater amount of the applied liquid to be captured and sorbed by porous fuels. As increasing amounts of air are introduced into the foam solution, the foam consistency changes from a wet foam to a fluid one, to a stiff, lather-like foam, and, finally, to a drier, high-expansion foam.



**1.3.4** The fire fighter should be aware that by changing the characteristics of the foam, the rate of drained solution available to wet the fuel will change. Fast-draining foams provide more solution to the fuel in a shorter time frame than do slow-draining foams. Consequently, more is not always better. The fire fighter has the ability to change the characteristics of the foam to meet different situations. This change of characteristics can be accomplished by changing the mix ratio, the type or operating pressure of the foam hardware, or the application technique.

**1.3.5** Mix ratio affects physical properties such as surface tension and the wetting ability of the foam solution. Mix ratios in the range of 0.1 to 1.0 percent significantly reduce surface tension values below that exhibited by water, resulting in improved coverage by the applied foam and wetting of the fuel.

**1.3.6** Mix ratio also affects the characteristics of the foam produced with a given foam-generating system. The foam expansion and the drain time control how fast the foam solution is released to the fuel. Foam-generating systems that increase the amount of air captured within the foam solution generally result in greater expansion and slower drain times. Higher mix ratios generally increase the ease of obtaining more highly expanded foams with slower drain times, which decreases the rate of wetting and penetration.

## Chapter 2 Referenced Publications

**2.1 General.** The documents or portions thereof listed in this chapter are referenced within this guide and should be considered part of the recommendations of this document.

**2.2 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

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

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

### 2.4 References for Extracts in Advisory Sections.

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

NFPA 1901, *Standard for Automotive Fire Apparatus*, 2009 edition.

NFPA 1925, *Standard on Marine Fire-Fighting Vessels*, 2008 edition.

## Chapter 3 Definitions

**3.1 General.** The definitions contained in this chapter apply to the terms used in this guide. Where terms are not defined in this chapter or within another chapter, they should be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, is 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 Guide.** A document that is advisory or informative in nature and that contains only nonmandatory provisions. A guide may contain mandatory statements such as when a guide can be used, but the document as a whole is not suitable for adoption into law.

**3.2.3\* 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.

### 3.3 General Definitions.

**3.3.1 Aspirate.** To draw in air; nozzle-aspirating systems draw air into the nozzle to mix with the foam solution.

**3.3.2 Batch Mix.** The manual addition of foam concentrate to a water storage container or tank to make foam solution.

**3.3.3 Bubble.** The building block of foam composed of a film of fluid enclosing a volume of air.

**3.3.4\* Class A Foam.** Foam for use on fires in Class A fuels. [1150, 2010]

**3.3.5 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. [1150, 2010]

**3.3.6\* Compressed Air Foam System (CAFS).** A foam system that combines air under pressure with foam solution to create foam in the hose or a mixing chamber.

**3.3.7\* Consistency.** The cohesiveness and visual appearance of a foam, described in terms of bubble size and uniformity, bubble stability or life, and relative fluidity.

**3.3.8 Direct Attack.** Fire-fighting operations involving the application of extinguishing agents directly onto the burning fuel.

**3.3.9 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. [1150, 2010]

**3.3.10 Eductor.** A device that uses the Venturi principle to siphon a liquid into a water stream. The pressure at the throat is below atmospheric pressure, allowing liquid at atmospheric pressure to flow into the water stream.

**3.3.11\* Expansion Ratio.** The ratio of the volume of the foam in its aerated state to the original volume of the nonaerated foam solution. [1901, 2009]

**3.3.12 Exposure Protection.** Application of an agent to uninvolved areas to limit absorption of heat to a level that will minimize damage and/or resist ignition.

**3.3.13 Fire Situation.** Factors pertaining to a fire that affect decisions relating to fire suppression including but not limited to