# NFPA 418

# Standard for Heliports

## 2006 Edition



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

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**NFPA 418**

**Standard for**

# Heliports

**2006 Edition**

This edition of NFPA 418, *Standard for Heliports*, was prepared by the Technical Committee on Helicopter Facilities. It was issued by the Standards Council on January 27, 2006, with an effective date of February 16, 2006, and supersedes all previous editions.

This edition of NFPA 418 was approved as an American National Standard on February 16, 2006.

## Origin and Development of NFPA 418

The development of NFPA 418 began in 1965 after the NFPA Sectional Committee on Aircraft Hangars and Airport Facilities was asked to provide guidance on the construction and protection of elevated heliports. Earlier work had been done by the NFPA Sectional Committee on Aircraft Rescue and Fire Fighting with regard to fire protection in the event of accidents during flight operations, and the NFPA Sectional Committee on Aircraft Fuel Servicing developed the safeguards needed for the prevention of fire accidents during fueling operations at such locations.

In 1967, a Tentative Standard on Elevated Heliport Construction and Protection was approved at the NFPA Annual Meeting. The 1968 text was a revision of the tentative standard (including a change in title). The 1973 edition was a complete revision of the 1968 edition. Further amendments were made in 1979. The title of the 1990 edition of this standard was changed from *Standard on Rooftop Heliport Construction and Protection* to *Standard for Heliports*. The 1990 edition added chapters for land-based facilities and offshore heliports.

The standard was revised for 1995. Criteria for rooftop helicopter hangars were added for the 2001 edition.

The 2006 edition is a partial revision.

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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 fire protection criteria for the design and construction of elevated and ground level heliports, helistops, and helipads; fire protection requirements for heliports, helistops, and helipads; and requirements for rescue and fire-fighting operations at heliports, helistops, and helipads.



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## Contents

**Chapter 1 Administration** ..... **418–** 4
1.1 Scope ..... **418–** 4
1.2 Purpose ..... **418–** 4

**Chapter 2 Referenced Publications** ..... **418–** 4
2.1 General ..... **418–** 4
2.2 NFPA Publications ..... **418–** 4
2.3 Other Publications ..... **418–** 4
2.4 References for Extracts in Mandatory Sections ..... **418–** 4

**Chapter 3 Definitions** ..... **418–** 4
3.1 General ..... **418–** 4
3.2 NFPA Official Definitions ..... **418–** 4
3.3 General Definitions ..... **418–** 5

**Chapter 4 General Requirements — Land-Based Facilities** ..... **418–** 5
4.1 General ..... **418–** 5
4.2 Plans ..... **418–** 5
4.3 Tank Locations ..... **418–** 5
4.4 Fire-Fighting Access ..... **418–** 5
4.5 Landing Pad Pitch ..... **418–** 5
4.6 No Smoking ..... **418–** 5
4.7 Fueling System ..... **418–** 5

**Chapter 5 Rooftop Landing Facilities** ..... **418–** 5
5.1 General ..... **418–** 5
5.2 Structural Support ..... **418–** 5
5.3 Landing Pad Pitch ..... **418–** 5
5.4 Landing Pad Construction Materials ..... **418–** 5
5.5 Means of Egress ..... **418–** 6
5.6 Fire-Fighting Access ..... **418–** 6
5.7 Fire Protection ..... **418–** 6
5.8 Fire Alarm ..... **418–** 6

**Chapter 6 Rooftop Hangars** ..... **418–** 6
6.1 Construction ..... **418–** 6
6.2 Rooftop Hangar Floor Drainage ..... **418–** 7
6.3 Suspended or Elevated Heaters ..... **418–** 7
6.4 Lighting and Electrical Systems ..... **418–** 7
6.5 Lightning Protection ..... **418–** 7
6.6 Protection of Helicopter Rooftop Hangars ..... **418–** 7
6.7 Portable Fire Extinguishers for Rooftop Hangars ..... **418–** 7

**Chapter 7 Water Supply** ..... **418–** 7
7.1 Calculation of Water Supply for Foam Systems ..... **418–** 7

**Chapter 8 Offshore Heliports** ..... **418–** 7
8.1 Plans ..... **418–** 7
8.2 Fire-Fighting Access ..... **418–** 7
8.3 Landing Pad Pitch ..... **418–** 7

**Chapter 9 Portable Fire Extinguishers** ..... **418–** 7
9.1 Quantity and Rating ..... **418–** 7
9.2 Servicing ..... **418–** 8

**Annex A Explanatory Material** ..... **418–** 8

**Annex B Heliport Emergency Planning and Training for Safety Personnel** ..... **418–** 8

**Annex C Establishing Extinguishing Agent Quantities and Discharge Rates** ..... **418–** 9

**Annex D Informational References** ..... **418–**12

**Index** ..... **418–**13



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# NFPA 418

## Standard for

# Heliports

## 2006 Edition

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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.

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

## Chapter 1 Administration

**1.1 Scope.**

**1.1.1** This standard specifies the minimum requirements for fire protection for heliports and rooftop hangars.

**1.1.2** This standard does not apply to ground-level helicopter hangars.

**1.1.3** All hangars not covered by this standard are required to comply with NFPA 409, *Standard on Aircraft Hangars*.

**1.1.4** Temporary landing sites and emergency evacuation facilities are outside the scope of this standard.

**1.2* Purpose.** The purpose of this standard is to establish minimum fire safety requirements for operation at heliports for the protection of persons, aircraft, and other property.

## 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 10, *Standard for Portable Fire Extinguishers,* 2002 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2002 edition.

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

NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems,* 2003 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection,* 2003 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* 2003 edition.

NFPA 70, *National Electrical Code®,* 2005 edition.

NFPA 99, *Standard for Health Care Facilities,* 2005 edition.

NFPA *101®*, *Life Safety Code®,* 2006 edition.

NFPA 220, *Standard on Types of Building Construction,* 2006 edition.

NFPA 407, *Standard for Aircraft Fuel Servicing,* 2001 edition.

NFPA 409, *Standard on Aircraft Hangars,* 2004 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems,* 2004 edition.

**2.3 Other Publications.**

**2.3.1 FAA Publication.** Federal Aviation Administration, Department of Transportation, Distribution Unit, M-494.3, Washington, DC 20590.

FAA A/C 150/5390-2B, *Heliport Design Advisory Circular*, January 20, 1994.

**2.3.2 UL Publication.** Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 162, *Standard for Foam Equipment and Liquid Concentrates*, 1994 with revisions through September 1999.

**2.3.3 Other Publication.**

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

**2.4 References for Extracts in Mandatory Sections. (Reserved)**

## 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* 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.

**3.2.4 Shall.** Indicates a mandatory requirement.

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

**3.2.6 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.



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**3.3 General Definitions.**

**3.3.1 Area.**

**3.3.1.1*** ***Critical Area.*** The area calculated to be one-half the overall length of the helicopter multiplied by three times the width of the widest portion of the fuselage.

**3.3.1.2** ***Helicopter Storage and Servicing Area.*** That part of a rooftop hangar normally used for the storage and servicing of one or more helicopters, not including any adjacent or contiguous areas or structures, such as shops, storage areas, and offices.

**3.3.1.3*** ***Practical Critical Fire Area (PCA).*** The area, for foam discharge purposes, calculated as one-half the fuselage length multiplied by three times the fuselage width.

**3.3.2 Critical Area.** See 3.3.1.1.

**3.3.3 Emergency Evacuation Facility.** A designated and clear area at rooftop or ground level intended exclusively for emergency/rescue operations by helicopters.

**3.3.4* Foam Fire-Extinguishing System.** A low-expansion foam fire-extinguishing system.

**3.3.5 Helicopter Storage and Servicing Area.** See 3.3.1.2.

**3.3.6 Helipad Support Structure.** A structure used for helipad and/or helicopter maintenance or storage that is not classified as a rooftop hangar.

**3.3.7* Heliport.** An identifiable area located on land, on water, or on a structure that also includes any existing buildings or facilities thereon, used or intended to be used for landing and takeoff of helicopters.

**3.3.7.1** ***Offshore Landing Heliport.*** A heliport located on fixed or mobile structures and vessels in a marine environment that do not have means of entry and egress connected directly to shore.

**3.3.8 Overall Length.** The length of a helicopter from the main rotor fully extended to the tail rotor fully extended.

**3.3.9 Practical Critical Fire Area (PCA).** See 3.3.1.3.

**3.3.10 Rooftop Hangar.** A structure on top of a building where helicopters are housed, stored, or maintained.

**3.3.11 Rooftop Landing Pad.** The entire load-bearing surface intended for the touchdown and lift off (TLOF) of helicopters.

**3.3.12 Temporary Landing Site.** A site intended to be used for a period of less than 30 consecutive days, and for no more than 10 operations per day.

## Chapter 4 General Requirements — Land-Based Facilities

**4.1 General.** The requirements in this chapter shall apply to all land-based facilities. *(See Chapter 8 for requirements applying to offshore heliports.)*

**4.2* Plans.** Plans for construction and protection of heliports shall be approved by the authority having jurisdiction.

**4.3 Tank Locations.**

**4.3.1** Storage, handling, and use of flammable and combustible liquids shall be in accordance with NFPA 30, *Flammable and Combustible Liquids Code.*

**4.3.2** Oxygen and other medical gases shall be stored and used in accordance with Section 9.4 of NFPA 99, *Standard for Health Care Facilities.*

**4.3.3** Aboveground flammable liquid storage tanks, compressed gas storage tanks, and liquefied gas storage tanks shall be laterally located at least 50 ft (15.2 m) from the edge of the final approach and takeoff (FATO) area as defined in FAA A/C 150/5390-2B, *Heliport Design Advisory Circular.*

**4.4 Fire-Fighting Access.**

**4.4.1** The heliport shall have at least one access point for fire-fighting/rescue personnel, and, where practical, a second access point shall be available and located remotely from the first.

**4.4.2** Fences shall not prevent access by fire-fighting/rescue personnel.

**4.5 Landing Pad Pitch.** The heliport shall be pitched or sloped so that drainage flows away from access points and passenger holding areas.

**4.6 No Smoking.**

**4.6.1** No smoking shall be permitted within 50 ft (15.2 m) of the landing pad edge.

**4.6.2** NO SMOKING signs shall be erected at access/egress points to the heliport.

**4.7 Fueling System.** Fueling systems shall be designed in accordance with NFPA 407, *Standard for Aircraft Fuel Servicing.*

**4.7.1** Fixed fueling dispensing equipment shall be located outside of rooftop hangars.

**4.7.2** Fueling equipment shall not hinder or obstruct access to exits or fire-fighting equipment.

**4.7.3** Fuel pump manifolds shall be located 25 ft (7.6 m) from rooftop hangars and fixed fire protection equipment.

## Chapter 5 Rooftop Landing Facilities

**5.1 General.** The requirements in Chapters 4 and 5 shall apply to all rooftop landing facilities.

**5.2* Structural Support.** Main structural support members that could be exposed to a fuel spill shall be made fire resistant using listed materials and methods to provide a fire-resistance rating of not less than 2 hours.

**5.3 Landing Pad Pitch.** The rooftop landing pad shall be pitched to provide drainage at a slope of 0.5 percent to 2 percent.

**5.3.1** The pitch of the pad shall be designed to protect, at a minimum, the primary egress path, passenger holding area, rooftop hangar, and fire protection activation systems.

**5.3.2** Drainage flow shall not penetrate alternate egress points, stairways, ramps, hatches, and other openings not designed for drainage.

**5.4 Landing Pad Construction Materials.**

**5.4.1** The rooftop landing pad surface shall be constructed of approved noncombustible, nonporous materials.

**5.4.2** The contiguous building roof covering within 50 ft (15.2 m) of the landing pad edge shall have a Class A rating.



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**5.5* Means of Egress.** At least two approved means of egress from the rooftop landing pad edge to the roof shall be provided and shall be remotely located from each other.

**5.5.1** For heliports occupied by 50 or more people, two approved means of egress from the roof shall be provided and shall be remotely located from each other, not less than 30 ft (9.1 m) apart.

**5.5.2** For heliports occupied by fewer than 50 people, one approved means of egress from the roof shall be provided.

**5.5.3** Means of egress from the rooftop landing pad and roof shall not obstruct flight operations.

**5.6 Fire-Fighting Access.**

**5.6.1** The helicopter rooftop landing pad shall have at least two access points for fire-fighting purposes.

**5.6.2** Access for fire-fighting personnel through the landing pad egress shall be permitted.

**5.6.3*** Where required by the authority having jurisdiction, an approved access to the building's interior shall be provided through each required exit stairway that extends onto the roof.

**5.7 Fire Protection.** A foam fire-extinguishing system with either a fixed discharge outlet(s) in accordance with 5.7.3 or a hose line(s) in accordance with 5.7.4 shall be designed and installed to protect the rooftop landing pad, unless otherwise permitted by the following:

(1) A foam fire-extinguishing system shall not be required for heliports located on open parking structures or buildings that are not normally occupied.
(2) For H-1 heliports, two portable foam extinguishers, each having a rating of 20-A:160-B, shall be permitted to be used to satisfy the requirement of Section 5.7.

**5.7.1** Where trained personnel are not available, fixed fire protection outlet(s) shall be provided.

**5.7.2*** The foam discharge rate shall be as shown in Table 5.7.2.

**Table 5.7.2 Foam Discharge Rates for Fixed Discharge Systems Only**

| Foam | Discharge Rate | |
|---|---|---|
| | $gpm/ft^2$ | $(L/min)/m^2$ |
| AFFF | 0.10 | 4.1 |
| Fluoroprotein | 0.16 | 6.5 |
| Protein | 0.20 | 8.1 |

**5.7.3** The area of application of foam discharge for fixed discharge outlet systems shall be the entire rooftop landing pad for a duration of 5 minutes.

**5.7.4*** The area of application of foam discharge for hose line systems shall be the practical critical fire area for the category of the helicopter landing facility in accordance with Table 5.7.4 for a duration of 2 minutes.

**5.7.4.1** A fixed discharge outlet system shall be either fixed stationary nozzles around the perimeter or one or more oscillating monitor/nozzle(s).

**Table 5.7.4 Practical Critical Fire Areas for Hose Line Systems Only**

| Heliport Category | Helicopter Overall Length* | Practical Critical Fire Area | |
|---|---|---|---|
| | | $ft^2$ | $m^2$ |
| H-1 | Less than 50 ft (15.2 m) | 375 | 34.8 |
| H-2 | 50 ft (15.2 m) up to but not including 80 ft (24.4 m) | 840 | 78.0 |
| H-3 | 80 ft (24.4 m) up to but not including 120 ft (36.6 m) | 1440 | 133.8 |

*Helicopter length, including the tail boom and the rotors.

**5.7.5** The water supply for the foam system shall be from a source approved by the authority having jurisdiction.

**5.7.5.1** Fire pumps, if used, shall be installed in accordance with NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection.*

**5.7.5.2** Standpipes and hose stations, if used, shall be installed in accordance with NFPA 14, *Standard for the Installation of Standpipe and Hose Systems.*

**5.7.5.3** Where freezing is possible, freeze protection shall be provided.

**5.7.6** The foam components shall be installed in an area of the heliport and shall not penetrate the approach takeoff surface, transitional surfaces, and safety area as defined in FAA A/C 150/5390-2B, *Heliport Design Advisory Circular.*

**5.7.7** At facilities where there is more than one rooftop landing pad, the supply of foam available shall be sufficient to cover an incident on at least one of the pads.

**5.7.8** Where fixed foam systems utilizing fixed deck nozzles or oscillating foam turrets, or both, are installed, system components shall be listed or approved.

**5.8 Fire Alarm.** A means of communication shall be provided from the roof area to notify the fire department of emergencies.

**5.8.1** Where buildings are provided with a fire alarm system, a manual pull station shall be provided for each designated means of egress from the roof. *(See 5.5.1.)*

## Chapter 6 Rooftop Hangars

**6.1 Construction.**

**6.1.1** Building construction of the rooftop hangar shall be as a minimum Type II (111) construction in accordance with NFPA 220, *Standard on Types of Building Construction*, except for the floor, which shall have a minimum 2-hour fire resistance rating.

**6.1.2** Other helicopter support operations within the rooftop hangar, such as offices, medical supplies, gas storage, and fire protection equipment, shall meet the following criteria:

(1) They shall be separated by walls and ceilings having a minimum fire resistance rating of 1 hour.



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(2) They shall have openings protected by listed fire doors or shutters having a minimum fire resistance rating of 45 minutes.

**6.1.3** Partitions and ceilings separating rooftop hangars from other building occupancies shall have a minimum fire resistance rating of 2 hours, and doors shall have a minimum fire resistance rating of 1½ hours.

**6.1.4** Means of egress shall be in accordance with NFPA *101*, *Life Safety Code*.

**6.1.4.1** Egress doors that do not require the opening of doors accommodating aircraft shall be provided in each partitioned space.

**6.1.4.2** Intervals between doors shall not exceed 150 ft (45 m) on all exterior walls or 100 ft (30 m) along interior walls.

**6.1.4.3** Egress/access points to and from the roof shall be marked.

**6.2 Rooftop Hangar Floor Drainage.**

**6.2.1** Floor drainage systems shall be provided to restrict the spread of fuel in order to reduce fire and explosion hazards from fuel spillage.

**6.2.2** Drainage systems shall use metallic pipe drained to a safe location meeting one of the following criteria:

(1) The system shall be designed with traps.
(2) The system shall be provided with ventilation to prevent vapor mixtures from forming within the underground drainage system.

**6.2.3** Drainage systems in helicopter storage and servicing areas shall be designed and constructed so that they have capacity to prevent buildup of flammable liquids and water over the drain inlet when fire protection systems and hose streams are discharging at the design rate.

**6.2.4** The pitch of the rooftop hangar floor shall be a minimum of ½ of 1 percent.

**6.2.5** The floor pitch provided shall be calculated taking into consideration the towing requirements, helicopter weight, maintenance, and so forth.

**6.2.6** Curbs, ramps, or drains shall be provided at all openings from helicopter storage and servicing areas, or the slope of the floor shall be such as to prevent the flow of liquids through the openings.

**6.2.7** Pits for service facilities, such as for compressed air and electrical outlets, shall drain into the floor drainage system.

**6.2.8** Grates and drain covers shall be of sufficient strength to support the point loading of the heaviest type of helicopter or equipment that the rooftop hangar serves.

**6.2.9** Grates and covers shall be removable to facilitate cleaning and flushing.

**6.3 Suspended or Elevated Heaters.** In helicopter storage and servicing areas, listed electric, gas, or oil heaters shall be permitted and shall be installed at least 10 ft (3 m) away from the helicopter engines.

**6.4 Lighting and Electrical Systems.**

**6.4.1** Artificial lighting shall be restricted to electrical lighting.

**6.4.2** Installations of electrical equipment shall be in compliance with the provisions for aircraft hangars contained in Article 513 of NFPA 70, *National Electrical Code®*.

**6.5 Lightning Protection.** Where provided, lightning protection shall be installed in accordance with NFPA 780, *Standard for the Installation of Lightning Protection Systems*.

**6.6 Protection of Helicopter Rooftop Hangars.**

**6.6.1** Helicopter storage and servicing areas shall be protected by an AFFF foam water sprinkler system designed, installed, and tested in accordance with NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*.

**6.6.2** Foam concentrate shall meet the requirements of UL 162, *Standard for Foam Equipment and Liquid Concentrates*.

**6.6.3** All other areas of the rooftop hangar shall be protected by water sprinkler systems designed, installed, and tested in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

**6.7 Portable Fire Extinguishers for Rooftop Hangars.**

**6.7.1** Portable fire extinguishers for rooftop hangars shall be provided in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.

**6.7.2** In helicopter storage and service areas, the distribution of fire extinguishers shall be in accordance with the extra hazard classification of NFPA 10, *Standard for Portable Fire Extinguishers*.

## Chapter 7 Water Supply

**7.1* Calculation of Water Supply for Foam Systems.** Where foam systems are provided for the rooftop landing pad area and rooftop hangar, the water supply shall be calculated based on the demand for the largest system.

## Chapter 8 Offshore Heliports

**8.1* Plans.** Plans for construction and protection of heliports located on fixed and mobile offshore installations shall be approved by the authority having jurisdiction.

**8.2 Fire-Fighting Access.**

**8.2.1** The heliport shall have at least one access point for fire-fighting/rescue personnel.

**8.2.2** Where practical, a second access point shall be available and shall be located remotely from the first.

**8.3 Landing Pad Pitch.** Heliports shall be designed to prevent the standing collection of liquids and to prevent liquids from spreading to or spilling on accommodation spaces or working spaces.

## Chapter 9 Portable Fire Extinguishers

**9.1 Quantity and Rating.**

**9.1.1** At least one portable fire extinguisher as specified in Table 9.1.1 shall be provided for each takeoff and landing area, parking area, and fuel storage area, unless otherwise permitted by 9.1.2.



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**Table 9.1.1 Minimum Ratings of Portable Fire Extinguishers for Heliport Categories**

| Heliport Category | Helicopter Overall Length* | Minimum Rating |
|---|---|---|
| H-1 | <50 ft (15.2 m) | 4-A:80-B |
| H-2 | 50 ft (15.2 m) up to but not including 80 ft (24.4 m) | 10-A:120-B |
| H-3 | 80 ft (24.4 m) up to but not including 120 ft (36.6 m) | 30-A:240-B |

*Helicopter length, including the tail boom and the rotors.

**9.1.2** The requirement of 9.1.1 shall not apply to unattended ground-level heliports.

**9.2 Servicing.** Portable fire extinguishers shall comply with NFPA 10, *Standard for Portable Fire Extinguishers*, Chapters 1, 4, 5, and 6.

## 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.1.2** See Annex B, Heliport Emergency Planning and Training for Safety Personnel.

**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.3.2.3 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.3.3.1.1 Critical Area.** See Annex C for additional information.

**A.3.3.1.3 Practical Critical Fire Area (PCA).** See also Annex C.

**A.3.3.4 Foam Fire-Extinguishing System.** A foam fire-extinguishing system can be a fixed discharge outlet system utilizing fixed storage and piping connected to fixed outlets or monitor nozzles and manually activated by pushing a button on a console or a pull station. It also can be a hose line system connected to fixed storage.

**A.3.3.7 Heliport.** The term *heliport* applies to all sites used or intended to be used for the landing and takeoff of helicopters.

**A.4.2** FAA A/C 150/5390-2B, *Heliport Design Advisory Circular*, contains design and construction information on heliports. This advisory circular provides for adequate clearance between operating aircraft and buildings or structures located at the heliport. The FAA advisory circular should be consulted to ensure that adequate safe practice and facilities are maintained.

**A.5.2** Where the landing pad is nonporous, fuel tight, and provided with a proper drainage system, and where fuel cannot flow to support members, the main structural support members would not need to be fire rated.

**A.5.5** For further information on exit principles, see NFPA *101*, *Life Safety Code*.

**A.5.6.3** Where doors accessing the interior of the building are locked, an approved means should be provided for entry of emergency responders.

**A.5.7.2** Where personnel trained in the operations of the equipment are in attendance, a hose line system is preferred. *(Also see Annex C.)*

**A.5.7.4** The area of application and the duration where using a hose line system is reduced because foam is applied efficiently and directly on the fire by trained personnel.

**A.7.1** The water supply is not intended to be based on simultaneous operation of both systems.

**A.8.1** The design of heliports located on fixed or mobile offshore installations generally is based on landing sites of steel construction. However, in no way should this be construed as a recommendation of steel over other suitable building material.

## Annex B Heliport Emergency Planning and Training for Safety Personnel

*This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.*

**B.1 General.** If safety personnel are provided at a heliport, the heliport operator should provide initial and recurrent training aimed at providing the safety personnel with the knowledge and skills necessary to deal effectively with an emergency at the heliport.

**B.1.1** The training should address, at least, the following subjects:

(1) Operation of the heliport



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(2) Safety procedures around helicopters during ground operations
(3) Communication systems at the heliport
(4) Heliport emergency plan

**B.1.2** Heliport emergency planning is the process of preparing a heliport to cope with an emergency that takes place at the heliport or in its vicinity. The following are examples of heliport emergencies:

(1) Aircraft emergencies, such as crashes on or off the heliport
(2) Medical emergencies
(3) Dangerous goods occurrences
(4) Fires
(5) Natural disasters

**B.1.3** The purpose of heliport emergency planning is to minimize the impact of an emergency by saving lives and maintaining aircraft operations.

**B.1.4** The heliport emergency plan sets out the procedures for coordinating the response of heliport agencies or services (e.g., air traffic services unit, fire-fighting services, heliport administration, medical and ambulance services, aircraft operators, security services, and police) and the response of agencies in the surrounding community (fire departments, police, medical and ambulance services, hospitals, military, and harbor patrol or Coast Guard) that could be of assistance in responding to the emergency.

**B.1.4.1** A heliport emergency response plan should be established at a heliport.

**B.1.4.2** The plan should identify agencies that, in the opinion of the heliport operator, could be of assistance in responding to an emergency at the heliport or in its vicinity.

**B.1.4.3** The plan should specify the procedures for at least the following emergencies:

(1) Aircraft crash or other accident within the heliport perimeter
(2) Aircraft crash outside the heliport perimeter
(3) Trauma injury to personnel
(4) Medical emergencies

**B.1.4.4** Where an approach/departure path at a heliport is located over water, the plan should identify which agency is responsible for coordinating rescue in the event of an aircraft ditching and indicate how to contact that agency.

**B.1.4.5** The plan should include, at a minimum, the following information:

(1) Types of emergencies planned for
(2) How to initiate the plan for each emergency specified
(3) Names of agencies on and off the heliport to contact for each type of emergency, with telephone numbers or other contact information
(4) Role of each agency responding to each type of emergency
(5) List of pertinent and available on-heliport services with telephone numbers or other contact information
(6) Copies of any agreements with other agencies for mutual aid and the provision of emergency services
(7) Grid map of the heliport and its immediate vicinity
(8) Use of any of the following equipment, if that equipment is provided at the heliport:
   (a) Portable extinguishers
   (b) Fire hoses, nozzles, and other similar appliances
   (c) Extinguishing agents

**B.1.4.6** A heliport operator should consult all agencies identified in the plan about their role in the plan.

**B.1.4.7** The plan should be reviewed and the information in it updated yearly by the heliport operator.

**B.1.4.8** A test of the emergency response plan should be carried out at least once every 3 years at a heliport that provides a scheduled service for the transport of passengers.

**B.1.4.9** At a rooftop heliport, at least one person who has received the training described in this annex should be available during aircraft operations.

## Annex C Establishing Extinguishing Agent Quantities and Discharge Rates

*This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.*

**C.1 Introduction.** The calculations used to develop the minimum extinguishing agent quantities and discharge rates presented in Table C.1(a) and Table C.1(b) for rooftop heliports include the factors specified in C.1.1 through C.1.4.

**C.1.1 Aircraft Size.** This factor reflects the potential level of risk (e.g., passenger load), the potential fire load (e.g., fuel capacity), and the dimensions (i.e., fuselage length and width), that allow the identification of a meaningful operational objective [i.e., the area to be rendered fire-free (controlled or extinguished)].

**C.1.2 Relative Effectiveness of Agent Selected.** This factor is represented by the specific application rate identified for each of the common generic foam concentrate types.

**Table C.1(a) Method to Determine Helicopter Critical Fire Area and Required Minimum Amount of Water for a Hose Line (AFFF) System**

| Heliport Category | (ft) | | (ft) | ½ O.L. of Largest Helicopter (ft) | | Fuselage Width Tripled (ft) | | Practical Critical Fire Area ($ft^2$) | | Application Rate ($gpm/ft^2$) | | $Q_1$ (gal) | | $Q_2$ | | Q (gal) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H-1 | 0 | < | 50 | 25 | × | 15 | = | 375 | × | 0.10 | = | 37.5 | + | 100% | = | 75 |
| H-2 | 50 | < | 80 | 40 | × | 21 | = | 840 | × | 0.10 | = | 84 | + | 100% | = | 168 |
| H-3 | 80 | < | 120 | 60 | × | 24 | = | 1440 | × | 0.10 | = | 144 | + | 100% | = | 288 |

O.L.: Overall length, measured from tip of main rotor fully extended to tip of tail rotor fully extended.
Fuselage width: Actual fuselage width (does not include landing gear) measured from outside of cabin.
$Q_1$: Water to control within 1 minute. $Q_2$: Reserve to extinguish. Q: Total water to extinguish.



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**Table C.1(b) Method to Determine Helicopter Critical Fire Area and Required Minimum Amount of Water for a Hose Line (AFFF) System (SI units)**

| Heliport Category (m) | | | ½ O.L. of Largest Helicopter (m) | | Fuselage Width Tripled (m) | | Practical Critical Fire Area ($m^2$) | | Application Rate mm/min | | $Q_1$ (L) | | $Q_2$ | | Q (L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H-1 | 0 < | 15.2 | 7.6 | × | 4.6 | = | 34.8 | × | 4.1 | = | 141.9 | + | 100% | = | 283.8 |
| H-2 | 15.2 < | 24.4 | 12.2 | × | 6.4 | = | 78.0 | × | 4.1 | = | 317.9 | + | 100% | = | 635.8 |
| H-3 | 24.4 < | 36.6 | 18.3 | × | 7.3 | = | 133.8 | × | 4.1 | = | 545.0 | + | 100% | = | 1090 |

O.L.: Overall length, measured from tip of main rotor fully extended to tip of tail rotor fully extended.
Fuselage width: Actual fuselage width (does not include landing gear) measured from outside of cabin.
$Q_1$: Water to control within 1 minute. $Q_2$: Reserve to extinguish. Q: Total water to extinguish.

**C.1.3 Time Required to Achieve Control.** Large-scale fire tests, empirical data, and field experience indicate that 1 minute is both a reasonable and a necessary operational objective.

**C.1.4 Time Required to Maintain Controlled Area Fire-Free.** This factor is an operational objective that provides a safety factor for the initial fire attack while waiting for the arrival of backup support.

**C.2 Calculation Method History.**

**C.2.1** The calculation method is supported by research and experimental work done mainly at the United States Federal Aviation Administration (FAA) Technical Center. It was developed by the Rescue and Firefighting Panel II (RFFP II), a group of international experts in the field, convened by the International Civil Aviation Organization, in Montreal, Canada, circa 1970.

**C.2.2** The RFFP II initially focused on the concept of the theoretical critical fire area (TCA), which was identified in the FAA's large-scale fire tests as ". . . the area adjacent to the fuselage extending outward in all directions to a limit beyond which a large fuel fire would not melt an aluminum fuselage, regardless of the fire exposure time." For this concept to be useful, specific information about the size of the area was needed. Again, using the FAA Technical Center's work as a basis, the RFFP II defined the TCA as "the area adjacent to an aircraft in which fire must be controlled."

**C.3 Formulas.** The definition of TCA implies control of the fire within a specific area. In order to achieve this, dimensions need to be determined. The formulas that follow were developed from that earlier FAA Technical Center work. Using these formulas, the size of the area of interest can be calculated. For example,

If $L$ is less than 65 ft (20 m),

$$TCA = L \times (40 \text{ ft} + W)$$

or

$$TCA = L \times (12 \text{ m} + W)$$

If $L$ is greater than 65 ft (20 m),

$$TCA = L \times (100 \text{ ft} + W)$$

or

$$TCA = L \times (30 \text{ m} + W)$$

where:
$TCA$ = theoretical critical fire area
$L$ = average aircraft length
$W$ = average width of aircraft served at the airport of interest

**C.3.1** Conceptually, the TCA serves as a means for assessing the magnitude of the potential fire hazard of the aircraft accident environment. It *does not represent* the average, maximum, or minimum spill fire size associated with a particular aircraft. However, it does represent a starting point for determining realistic fire-extinguishing agent requirements. The formulas allow for the calculation of the TCA for different sizes of aircraft. The formulas are widely accepted throughout the aircraft fire service community and are applied as described in C.3.2 through C.3.12.

**C.3.2** A 1970 study concluded that in survivable aircraft crashes a practical fire area should be considered that was smaller than the theoretical area. Detailed criteria for the practical fire area and the related quantities of extinguishing agents were formulated during the second meeting of the RFFP II. In developing its material, the panel included a study of the quantities of agents used on actual fires. In 99 out of 106 such fires, the quantities of agents used were less than those recommended by the TCA calculations.

**C.3.3** As a result of the study, the RFFP II developed material recommending that the practical area be approximately two-thirds the theoretical area *[see Figure C.3.3]*. This principle has been adopted by the International Civil Aviation Organization (ICAO), NFPA, and the U.S. FAA in the development of tables that show extinguishing agent volumes for their respective standards and recommended practices. The practical critical fire area (PCA) for fixed-wing aircraft is commonly expressed as follows:

$$PCA = (0.67)(TCA)$$

where:
$PCA$ = practical critical fire area
$TCA$ = theoretical critical fire area

**C.3.4** In adapting the fixed-wing fire protection methodology to helicopters (rotary-wing aircraft), the committee considered the additional factors described in C.3.4.1 through C.3.4.4 that make the fire protection problem of helicopters unique.

**C.3.4.1 Occupied Space.** Relative to its fixed-wing counterpart, a smaller portion of the overall aircraft length is occupied.



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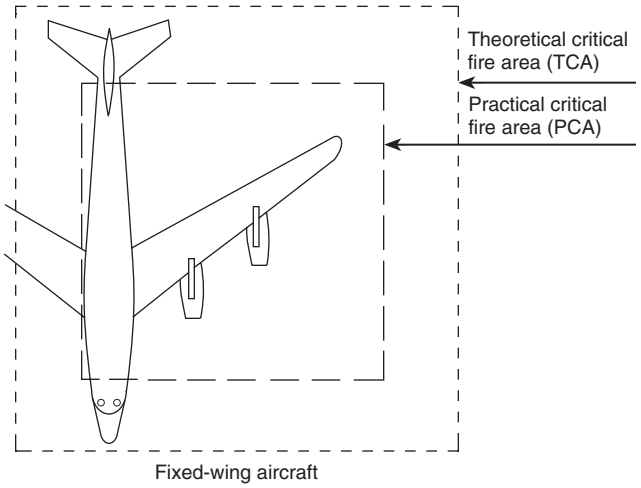



**FIGURE C.3.3 Practical Critical Fire Area Relative to Theoretical Critical Fire Area.**

**C.3.4.2 Fuel Quantities and Location.** Fuel tanks are not located in the "wings" or rotor blades, and relatively small quantities of fuel are involved.

**C.3.4.3 Impact Energy.** Relative to the fixed-wing counterpart, a helicopter accident generally occurs at slow ground speeds.

**C.3.4.4 Expected Aircraft Size.** In general, heliports are designed for the largest helicopter expected to utilize the facility, not the median size for the category. *(See Table 5.7.4.)*

**C.3.5** After considering the factors involved in the fixed-wing methodology and those factors that are unique to helicopters, the committee arrived at a theoretical critical area for helicopters that includes a longitudinal dimension of one-half the overall length of the helicopter and a width equal to three times the fuselage width. In addition, in the absence of any data that suggested a more appropriate alternative, the practical critical fire area has been determined to be 100 percent of the theoretical critical area. *[See Figure C.3.5.]*

**C.3.6** Another established principle is the distinction between control and extinguishment of a fire. Test data and a wide range of field experience indicate that the quantities of foam agent needed to control and extinguish an aircraft fire should be determined separately. This principle is expressed in the following calculation method, which provides the minimum agent volume for effective fire service operations:

$$Q = Q_1 + Q_2$$

where:
$Q$ = minimum agent volume for effective fire service operations
$Q_1$ = volume of agent needed for 1-minute control of PCA
$Q_2$ = volume of agent needed for continued control or complete extinguishment of fire related to PCA, or both

**C.3.7** The relationship between $Q_1$ and $Q_2$ as they were developed by the committee that studied the fixed-wing fire protection problem is as follows:

$$Q_1 = (AR)(PCA)$$

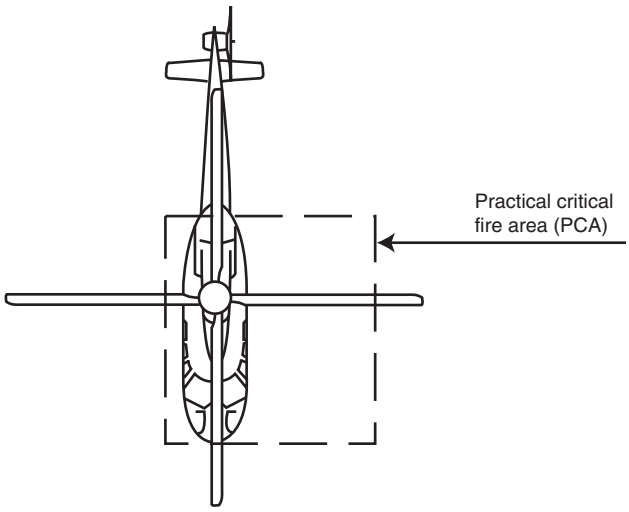



**FIGURE C.3.5 Practical Critical Fire Area for Helicopters.**

where:
$AR$ = application rate
$PCA$ = practical critical area

**C.3.8** Where the application rate (AR) is the unit volume of agent applied to a unit area of fire in a unit time (the exact units such as gpm/ft$^2$ or mm/min depend on the units convention being used), the volume of agent needed for continued control or complete extinguishment of fire is as follows:

$$Q_2 = f(Q_1)$$

And, it has been determined that, for all categories of heliports, $f = 1$.

Therefore:

$$Q = 2\left[(AR)(PCA)\right]$$

**C.3.9** A sample calculation of the total water quantity, $Q$, needed where aqueous film-forming foam concentrate is to be used at each of the three categories of heliport is provided in Table C.1(a) and Table C.1(b). A similar set of water quantities can be calculated for any other foam concentrate for which an accepted application rate is known. The value for the AFFF application rate in column 5 of Table C.1(a) and Table C.1(b) is substituted, and the indicated calculations are performed to obtain the value of $Q$ for the specific foam concentrate to be used.

**C.3.10** To fully appreciate the significance and simplicity of this methodology as a means of determining levels of fire protection, it should be clearly understood that $Q_1$ is only that minimum quantity of fire-fighting agent required for 1-minute fire control (90 percent extinguishment) of the anticipated practical critical fire area. Therefore, any fire and rescue service cannot be expected to perform an effective rescue effort where equipped with less than the quantity of primary extinguishing agent specified by the volume of $Q_1$ for the specific airport/heliport category. Furthermore, a fire suppression/rescue mission that is initiated using the required minimum application rate and is continued at that rate, while effectively extinguishing fire or securing unburned fuel within the practical area, ceases operations at the



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end of 1 minute. In other words, the agent specified by the volume $Q_1$ is depleted. There is no agent available for mop-up activities, foam blanket repair, or standby protection for continued rescue or salvage activities. Therefore, while the control volume $Q_1$ provides an operational significance that is critical to the rescue operation, it is, at the same time, limited.

**C.3.11** It should be clear, therefore, that an additional volume of foam agent, $Q_2$, needs to be available to extend an effective fire suppression and rescue operation beyond the initial 1-minute fire control period. This volume of agent is used to repair foam blanket damage that might be caused by evacuees and rescue workers walking through the foamed areas or by hot surfaces created by the initial fire. Furthermore, $Q_2$ is needed to extinguish all fire in the practical critical fire area and those fires outside the practical critical area that initially are determined to pose no threat to life.

**C.3.12** Agent quantity in accordance with $Q_2$ also provides standby protection before total extinguishment during interior aircraft search operations and for the removal of immobile survivors after fire control. It also is used for securing the fire area during initial aircraft salvage operations immediately after total fire extinguishment. Therefore, an aircraft fire service equipped with only the 1-minute fire control volume represented by $Q_1$ is expected to assume a significant level of risk. That risk cannot be considered a "calculated risk" unless the manager selecting the reduced agent volume knows the nature of the fire area and the potential hazard involved.

## Annex D Informational References

**D.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.

**D.1.1 NFPA Publication.** National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA *101®*, *Life Safety Code®*, 2006 edition.

**D.1.2 Other Publications.**

**D.1.2.1 FAA Publication.** Federal Aviation Administration, Department of Transportation, Distribution Unit, M-494.3, Washington, DC 20590.

FAA A/C 150/5390-2B, *Heliport Design Advisory Circular*, January 20, 1994.

**D.1.2.2 ICAO Publication.** International Civil Aviation Organization, Montreal, Canada.

Rescue and Firefighting Panel II (RFFP II), Research and experimental work, circa 1970.

**D.2 Informational References. (Reserved)**

**D.3 References for Extracts in Informational Sections. (Reserved)**



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# Index

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**-A-**

**Aboveground tank locations** ..... 4.3.3
**Access, fire-fighting** .....*see* Fire-fighting access
**Approved (definition)** ..... 3.2.1, A.3.2.1
**Area**
Critical area .....*see* Critical area
Helicopter storage and servicing area (definition) ..... 3.3.1.2
Practical critical fire area (PCA) .....*see* Practical critical fire area (PCA)
**Authority having jurisdiction (definition)** ..... 3.2.2, A.3.2.2

**-C-**

**Construction materials**
Rooftop hangars ..... 6.1
Rooftop landing facilities ..... 5.2, 5.4, A.5.2
**Critical area** .... 5.7.4, A.5.7.4, Table C.1(a), Table C.1(b), C.2.2, C.3
Definition ..... 3.3.1.1, A.3.3.1.1

**-D-**

**Definitions** ..... Chap. 3
**Drainage**
Landing pad pitches ..... 4.5, 5.3
Rooftop hangar floor ..... 6.2

**-E-**

**Egress, means of**
Rooftop hangars ..... 6.1.4
Rooftop landing heliports ..... 5.5, A.5.5
**Electrical systems, rooftop hangars** ..... 6.4
**Emergency evacuation facility (definition)** ..... 3.3.3
**Emergency planning** ..... Annex B
**Extinguishers, portable fire** ..... Chap. 9
Rooftop hangars ..... 6.7
Rooftop landing facilities ..... 5.7, A.5.7.2, A.5.7.4
**Extinguishing agent quantities and discharge rates** ..... Annex C

**-F-**

**Fire alarms, rooftop landing heliports** ..... 5.8
**Fire-fighting access**
Land-based heliports ..... 4.4
Offshore heliports ..... 8.2
Rooftop landing heliports ..... 5.6, A.5.6.3
**Fire protection** .....*see also* Extinguishers, portable fire
Extinguishing agent quantities and discharge rates ..... Annex C
Land-based heliports ..... 4.2, A.4.2
Offshore heliports ..... 8.1
Rooftop hangars ..... 6.6, 6.7
Rooftop landing heliports ..... 5.7, 5.8, A.5.7.2, A.5.7.4
Water supply ..... 5.7.5, Chap. 7
**Fire-resistance rating** ..... 5.2, 6.1.3, A.5.2
**Flammable and combustible liquids, storage, handling, and use of** ..... 4.3.1, 4.3.3
**Foam fire-extinguishing systems**
Definition ..... 3.3.4, A.3.3.4
Extinguishing agent quantities and discharge rates ..... Annex C
Rooftop hangars ..... 6.6.1, 6.6.2
Rooftop landing heliports ..... 5.7, 5.8, A.5.7.2, A.5.7.4
Water supply ..... 5.7.5, Chap. 7
**Fueling systems, land-based heliport** ..... 4.7

**-H-**

**Heaters, rooftop hangars** ..... 6.3
**Helicopter storage and servicing area (definition)** ..... 3.3.1.2; *see also* Rooftop hangars
**Helipad support structure (definition)** ..... 3.3.6; *see also* Rooftop hangars
**Heliports**
Definition ..... 3.3.7, A.3.3.7
Land-based ..... Chap. 4
Offshore landing ..... Chap. 8
Definition ..... 3.3.7.1
Rooftop ..... Chap. 5

**-L-**

**Land-based heliports** ..... Chap. 4
**Landing pad, rooftop** .....*see* Rooftop landing pad
**Landing pad pitch**
Land-based heliports ..... 4.5
Offshore heliports ..... 8.3
Rooftop landing heliports ..... 5.3
**Lighting systems, rooftop hangars** ..... 6.4
**Lightning protection, rooftop hangars** ..... 6.5
**Listed (definition)** ..... 3.2.3, A.3.2.3

**-M-**

**Means of egress**
Rooftop hangars ..... 6.1.4
Rooftop landing heliports ..... 5.5, A.5.5
**Medical gases, storage and use of** ..... 4.3.2

**-O-**

**Offshore landing heliports** ..... Chap. 8
**Overall length (definition)** ..... 3.3.8
**Oxygen, storage and use of** ..... 4.3.2

**-P-**

**Plans**
Construction and protection
Land-based heliports ..... 4.2, A.4.2
Offshore heliports ..... 8.1, A.8.1
Emergency ..... Annex B
**Practical critical fire area (PCA)** ..... 5.7.4, A.5.7.4, Table C.1(a), Table C.1(b)
Definition ..... 3.3.1.3, A.3.3.1.3
**Purpose of standard** ..... 1.2, A.1.2, Annex B

**-R-**

**References** ..... Chap. 2, Annex D
**Rooftop hangars** ..... Chap. 6
Definition ..... 3.3.10
**Rooftop landing heliports** ..... Chap. 5
**Rooftop landing pad** ..... 5.3 to 5.7, A.5.5 to A.5.7.4
Definition ..... 3.3.11

**-S-**

**Safety personnel, training of** ..... Annex B
**Scope of standard** ..... 1.1
**Shall (definition)** ..... 3.2.4



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**Should (definition)** ..... 3.2.5
**Smoking regulations** ..... 4.6
**Sprinkler systems**
Rooftop hangars ..... 6.6; *see also* Foam fire-extinguishing systems
Water supply ..... Chap. 7
**Standard (definition)** ..... 3.2.6
**Standpipes, rooftop landing heliports** ..... 5.7.5.2
**Structural support, rooftop landing facilities** ..... 5.2, A.5.2
**Support operations, rooftop hangars** ..... 6.1.2

**-T-**

**Tank locations, land-based heliports** ..... 4.3
**Temporary landing site (definition)** ..... 3.3.12
**Theoretical critical fire area (TCA)** ..... C.2.2, C.3
**Training, safety personnel** ..... Annex B

**-W-**

**Water supply** ..... 5.7.5, Chap. 7



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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.

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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.

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2. A representative includes an employee.
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**Company** _____
**Address** 9 Seattle St. **City** Seattle **State** WA **Zip** 02255
**Please indicate organization represented (if any)** Fire Marshals Assn. of North America

1. **a) NFPA Document Title** National Fire Alarm Code
   **b) NFPA No. & Edition** NFPA 72, 2002 ed. **c) Section/Paragraph** 4.4.7.1.1

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

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