

NFPA® 418

Standard for Heliports

2011 Edition



NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
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NFPA® 418

Standard for

Heliports

2011 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 December 14, 2010, with an effective date of January 3, 2011, and supersedes all previous editions.

This edition of NFPA 418 was approved as an American National Standard on January 3, 2011.

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 edition was a revision of the tentative standard, including a change in title, and the 1973 edition was a complete revision of the 1968 edition. The 1979 edition contained further amendments. The 1990 edition added chapters for land-based facilities and offshore heliports, and the title was changed from *Standard on Rooftop Heliport Construction and Protection*, to *Standard for Heliports*.

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

The 2006 edition was a partial revision.

The 2011 edition revises the requirements for means of egress, fuel equipment locations, and suppression system design and testing, and a requirement for emergency response planning has been added.

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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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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.

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. (See Annex B, *Helicopter Emergency Planning and Training for Safety Personnel*.)

1.3 New Technology.

1.3.1 Nothing in this standard shall be intended to restrict new technologies or alternative arrangements, provided the level of safety prescribed by this standard is not lowered.

1.3.2 Materials or devices not specifically designated by this standard shall be utilized in complete accord with all conditions, requirements, and limitations of their listings.

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*, 2010 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2010 edition.

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

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 2010 edition.

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

NFPA 30, *Flammable and Combustible Liquids Code*, 2008 edition.

NFPA 70®, *National Electrical Code*®, 2011 edition.

NFPA 72®, *National Fire Alarm and Signaling Code*, 2010 edition.

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

NFPA 101®, *Life Safety Code*®, 2009 edition.

NFPA 220, *Standard on Types of Building Construction*, 2009 edition.

NFPA 407, *Standard for Aircraft Fuel Servicing*, 2007 edition.

NFPA 409, *Standard on Aircraft Hangars*, 2011 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems*, 2011 edition.

2.3 Other Publications.

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

FAA AC 150/5390-2B, *Helicopter Design Advisory Circular*, September 30, 2004.

2.3.2 UL Publications. 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 U.S. Government Publications. U.S. Government Printing Office, Washington, D.C. 20402.

Military Specification, MIL-F-24385 (Navy), “Fire Extinguishing Agent, Aqueous Film Forming Foam (AFFF) Liquid Concentrate, For Fresh and Sea Water,” 21 November, 1969 (and all revisions and amendments thereto).

2.3.4 Other Publications.

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.

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

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

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

3.3.5* 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.

3.3.5.1 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.

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

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

3.3.8 Rooftop Landing Pad. The entire load-bearing surface intended for the touchdown and liftoff (TLOF) of helicopters.

3.3.9 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.)

4.1.1* Listing. This chapter shall provide requirements for the correct use of foam system components.

4.1.1.1 All components shall be listed for their intended use.

4.1.1.2 Where listings for components do not exist, components shall be approved.

4.2* Plans.

4.2.1 The design drawings for the construction and protection of the heliport shall be approved by the authority having jurisdiction.

4.2.2 The design of the heliport, including all the aeronautical components, shall be in accordance with FAA AC 150/5390-2B, *Heliport Design Advisory Circular*.

4.2.3 The final approach and takeoff (FATO) area, the approach/departure path, and the touchdown and liftoff (TLOF) area shall be designated on the design drawings.

4.3 Tank and Equipment 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, fuel storage tanks, and liquefied gas storage tanks shall be laterally located at least 50 ft (15.2 m) from the edge of the FATO area as defined in FAA AC 150/5390-2B, *Heliport Design Advisory Circular*.

4.4 Fire-Fighting Access.

4.4.1 The heliport shall have at least two access points for fire-fighting/rescue personnel. The access points shall be located at least 90 degrees from each other as measured from the center of the landing pad (TLOF).

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

4.5 Fuel Spill Control. The landing pad shall be designed so that fuel spills are directed away from access/egress 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 Fueling equipment shall not hinder or obstruct access to exits or fire-fighting equipment.

4.7.2 Fueling equipment shall be located 25 ft (7.6 m) from hangars and fixed fire protection equipment.

4.7.3 Fuel servicing equipment shall be designed to not penetrate the FATO and safety area obstruction clearance requirements in FAAAC 150/5390-2B, *Heliport Design Advisory Circular*.

4.8* Means of Egress. At least two means of egress that lead to a public way shall be provided from the landing pad.

4.8.1* The egress points shall be located at least 90 degrees from each other as measured from the center of the landing pad (TLOF).

4.8.2 The egress points shall be located remotely from each other, not less than 30 ft (9.1 m) apart.

4.8.3 No two egress points shall be located on the same side of the landing pad.

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.

5.3.3 The pitch of the pad shall not be required where the pad consists of a passive fire protection grid surface designed and listed for fuel catchment and containment.

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.

5.5* Means of Egress. Two means of egress from the rooftop landing pad to the building's egress system shall be provided.

5.5.1* The egress points shall be located at least 90 degrees from each other as measured from the center of the landing pad (TLOF).

5.5.2 The egress points shall be remotely located from each other, not less than 30 ft (9.1 m) apart.

5.5.3 No two egress points shall be located on the same side of the rooftop landing pad.

5.5.4* Means of egress from the landing pad shall not obstruct flight operations.

5.6 Fire-Fighting Access. (Reserved)

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 for the fire-extinguishing system shall be 0.10 gpm/ft² (4.1 L/min·m²) for aqueous film forming foam (AFFF).

5.7.3 Fixed Systems.

5.7.3.1* The area of application of foam discharge for fixed discharge outlet systems shall be the entire rooftop landing pad.

5.7.3.2 The duration of foam discharge for the fixed discharge outlet system shall be 5 minutes.

5.7.3.2.1 The supply calculation method shall be performed in accordance with Chapter 6 of NFPA 409, *Standard on Aircraft Hangars*.

5.7.4 Manual Fire-Fighting Equipment.

5.7.4.1* 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 5.7.4.1.

Table 5.7.4.1 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.

5.7.4.2 The duration of foam discharge for the hose line systems shall be 2 minutes.

5.7.4.3 The supply calculation method shall be performed in accordance with Chapter 6 of NFPA 409, *Standard on Aircraft Hangars*.



5.7.4.4 A fixed nozzle discharge outlet system shall be one of the following: fixed stationary nozzles around the perimeter, two or more oscillating monitors/nozzles, or in-deck nozzles within the perimeter of the deck.

5.7.5 The water supply for the foam system shall be from a source approved by the AHJ.

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 FAAAC 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.

5.7.9 The foam concentrate for the fixed system or manual fire-fighting equipment shall be listed in accordance with UL 162, *Standard for Foam Equipment and Liquid Concentrates*, and shall be on the qualified products list for MIL-F-24385, or equivalent.

5.8 Activation of Systems.

5.8.1* The fixed discharge outlet system shall be activated manually.

5.8.2* The activation shall be by manual pull stations located at each egress point from the rooftop landing pad. An additional manual pull station shall be located at an approved location inside the building from which the rooftop landing pad can be viewed.

5.8.3 Where buildings are provided with a fire alarm system, the activation of the system shall be monitored by the building fire alarm system in accordance with NFPA 72, *National Fire Alarm and Signaling Code*.

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

5.9.1 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.)

5.10 Testing.

5.10.1 Acceptance Testing.

5.10.1.1 The fixed foam discharge outlet system shall be tested with foam to determine the coverage of the rooftop landing pad.

5.10.1.1.1 The system shall cover 95 percent of the rooftop landing pad during the test.

5.10.1.1.2 The access points for fire fighting and for egress shall be covered.

5.10.1.2 The hose hand-lines shall be flow tested to demonstrate that the design objectives are met.

5.10.2 Inspection, Testing, and Maintenance. All water-based fire protection systems shall be inspected, tested, and maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.

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.
- (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 in accordance with NFPA 409, *Standard on Aircraft Hangars*.

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 AHJ.

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 onto accommodation spaces or working spaces.

Chapter 9 Portable Fire Extinguishers

9.1 General. The selection, installation, and maintenance of portable fire extinguishers shall comply with NFPA 10, *Standard for Portable Fire Extinguishers*.

9.2 Minimum Requirement. At least one portable fire extinguisher as specified in Table 9.2 shall be provided for each takeoff and landing area, parking area, and fuel storage area.

Table 9.2 Minimum Ratings of Portable Fire Extinguishers for Heliport Categories

Heliport Category	Helicopter Overall Length*	Minimum Rating
H-1	Less than 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.

- 9.3 Extinguishers Subject to Damage, Theft, or Tampering.** Where the portable extinguisher cannot be maintained and safeguarded against damage, theft, or tampering, the portable fire extinguisher shall be omitted with the approval of the AHJ.

Chapter 10 Emergency Operations

10.1 Emergency Response Plan. An emergency response plan shall be developed for each heliport.

10.2 Training. Annual training for the emergency response plan shall be conducted for facility personnel involved with heliport emergency operations. (See Annex B for guidance on training of facility personnel.)



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.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.3.3.3 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.3.3.5 Heliport. The term *heliport* applies to all sites used or intended to be used for the landing and takeoff of helicopters.

A.4.1.1 A foam system consists of a water supply, a foam concentrate supply, proportioning equipment, a piping system, foam makers, and discharge devices designed to distribute foam effectively over the hazard. Some systems include detection devices.

A.4.2 FAAAC 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.4.8 The two means of egress can also be used for access to the landing pad for fire-fighting and/or rescue operations. Where doors accessing the interior of the building are locked, an approved means should be provided for entry of emergency responders.

A.4.8.1 Figures A.4.8.1(a) and A.4.8.1(b) are examples of acceptable configurations of egress points on landing pads. The geometry of the landing pad in Figure A.4.8.1(b) is such that it has no sides and does not comply with 4.8.3; however, it does comply with the 90-degree rule in 4.8.1. Figure A.4.8.1(c) is an example of an unacceptable configuration, due to both egress points being on the same side of the landing pad.

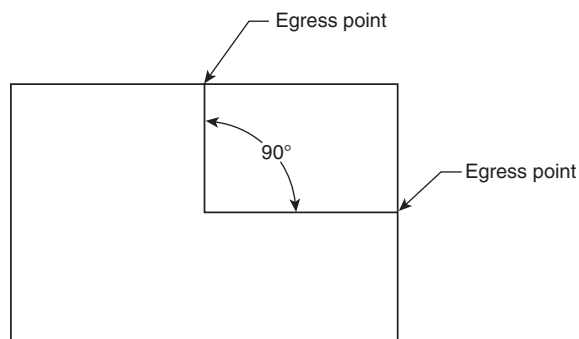


FIGURE A.4.8.1(a) Example of an Acceptable Configuration of Egress Points on a Landing Pad.

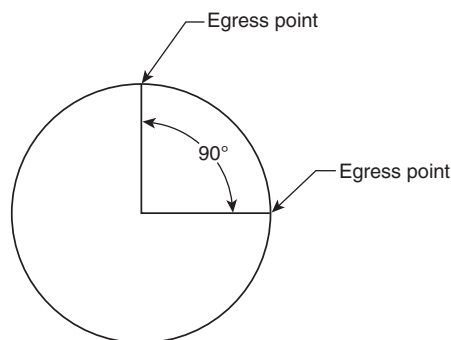


FIGURE A.4.8.1(b) Example of an Acceptable Configuration of Egress Points on a Landing Pad with No Sides.

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 Design of the means of egress from a rooftop landing pad might involve a compromise among several different code requirements. Rooftop landing pads bring with them an inherent risk. The means of egress must be provided for safety to human life. Strict compliance with a code's requirement for rated stairways off the landing pad is not the intent of this standard. The intent of this standard is to provide a minimum safeguard to provide a reasonable degree of safety to all persons on the roof. The building's egress system is dictated by

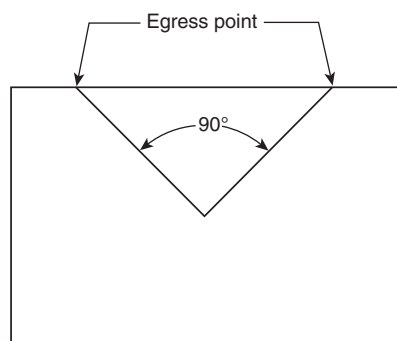


FIGURE A.4.8.1(c) Example of an Unacceptable Configuration of Egress Points on a Landing Pad.

the adopted building code. Once those persons enter the building's egress system, they are away from the FATO area.

A.5.5.1 See Figure A.4.8.1(a) through Figure A.4.8.1(c) for examples of acceptable configurations of egress points on landing pads. The geometry of the landing pad in Figure A.4.8.1(b) is such that it has no sides and cannot comply with 5.5.3; however, it does comply with the 90-degree rule in 5.5.1. Figure A.4.8.1(c) is not an acceptable configuration due to both egress points being on the same side of the landing pad.

A.5.5.4 When considering the means of egress from the landing pad and for the rooftop, obstructions to the FATO need to be avoided since they can create unsafe flight conditions that have been shown to cause aircraft accidents. Exterior, open stairways leading to the building's egress system should not encroach into the FATO.

A.5.7.2 Currently, the qualified products listed for MIL-F-24385 do not contain any fluoroprotein or protein foam products.

A.5.7.3.1 Consideration should be given to the environmental conditions of the rooftop landing pad in the design of the system, including wind, exhaust fans, and other factors that affect the distribution of the foam on the rooftop landing pad.

A.5.7.4.1 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.5.8.1 Training on the operation of the fire protection system should be in accordance with Annex B.

A.5.8.2 It is acceptable for the rooftop landing pad to be viewed using video or other acceptable means.

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
- (2) Safety procedures around helicopters during ground operations
- (3) Communication systems at the heliport
- (4) Heliport emergency plan
- (5) Operation of the fire protection system

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
- (5) Fire in the heliport, including fire-fighting access points and system
- (6) Evacuation of the heliport, including the heliport egress system

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.

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

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

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)		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.

Q₁: Water to control within 1 minute. Q₂: Reserve to extinguish. Q: Total water to extinguish.

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	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	= 35.0	× 4.1	= 143.5	+ 100%	= 287.0
H-2	15.2 < 24.4	12.2	× 6.4	= 78.0	× 4.1	= 319.8	+ 100%	= 639.6
H-3	24.4 < 36.6	18.3	× 7.3	= 133.6	× 4.1	= 547.8	+ 100%	= 1095.6

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.

Q₁: Water to control within 1 minute. Q₂: Reserve to extinguish. Q: Total water to extinguish.

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

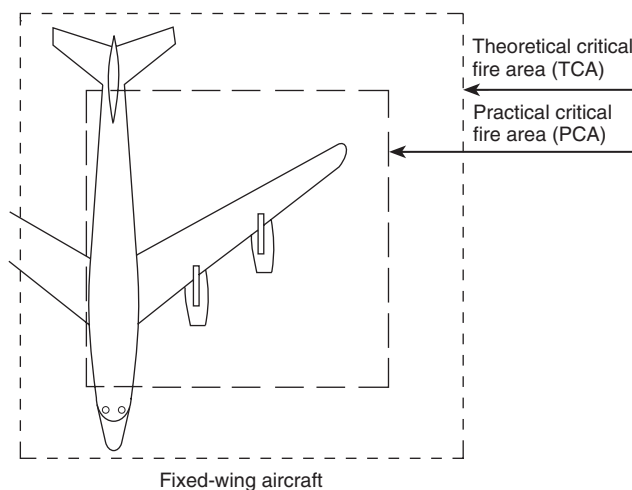


FIGURE C.3.3 Practical Critical Fire Area Relative to Theoretical Critical Fire Area.

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.

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 5.7.4.1.)

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.)

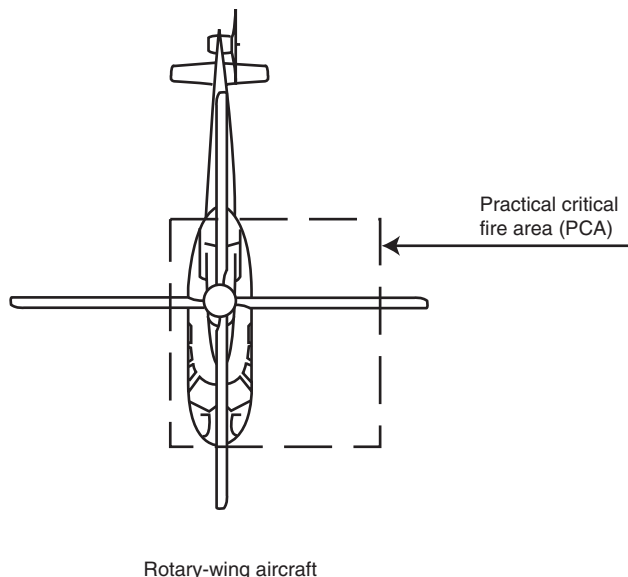


FIGURE C.3.5 Practical Critical Fire Area for Helicopters.

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:

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

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/ft² 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:

$$Q = 2[(AR)(PCA)]$$

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 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 Publications. (Reserved)

D.1.2 Other Publications.

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

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

D.1.2.2 ICAO Publications. International Civil Aviation Organization, Montreal, Canada.

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

D.1.2.3 U.S. Government Publications. U.S. Government Printing Office, Washington, D.C. 20402.

Military Specification, MIL-F-24385 (Navy), “Fire Extinguishing Agent, Aqueous Film Forming Foam (AFFF) Liquid Concentrate, For Fresh and Sea Water,” 21 November, 1969 (and all revisions and amendments thereto).

D.2 Informational References. (Reserved)

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