

NFPA 403

Standard for Aircraft Rescue and Fire-Fighting Services at Airports

2003 Edition



NFPA, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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NFPA 403

Standard for

Aircraft Rescue and Fire-Fighting Services at Airports

2003 Edition

This edition of NFPA 403, *Standard for Aircraft Rescue and Fire-Fighting Services at Airports*, was prepared by the Technical Committee on Aircraft Rescue and Fire Fighting and acted on by NFPA at its May Association Technical Meeting held May 18–21, 2003, in Dallas, TX. It was issued by the Standards Council on July 18, 2003, with an effective date of August 7, 2003, and supersedes all previous editions.

This edition of NFPA 403 was approved as an American National Standard on July 18, 2003.

Origin and Development of NFPA 403

Committee work leading to the development of a recommended practice by the Association commenced in 1947 following a request from the Civil Aeronautics Board (U.S.A.) for information on what constituted “adequate” ground fire-fighting equipment and personnel for airports served by air carrier aircraft.

NFPA Committee work continued during 1948, and in 1949 the Association adopted a tentative text at its Annual Meeting held in San Francisco, CA. In 1952 a revised text was submitted for adoption by the Association, and unanimously accepted. Since its original adoption, this text has been revised periodically with editions issued in 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1965, 1966, 1967, 1970, 1971, 1972, 1973, 1974, 1975, and 1978.

The 1988 edition comprised a complete revision to the text of the document to make it a standard and to segregate mandatory requirements from advisory material. Prior to the 1988 edition, all editions were recommended practices. The standard was revised again in 1993.

The 1998 edition was a partial revision.

The major change to this 2003 edition is the addition of staffing requirements.

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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 aircraft rescue and fire-fighting services and equipment, for procedures for handling aircraft fire emergencies, and for specialized vehicles used to perform these functions at airports, with particular emphasis on saving lives and reducing injuries coincident with aircraft fires following impact or aircraft ground fires. This Committee also shall have responsibility for documents on aircraft hand fire extinguishers and accident prevention and the saving of lives in future aircraft accidents involving fire.

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at Airports****2003 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.

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 F.

Chapter 1 Administration

1.1 Scope. This standard contains the minimum requirements for aircraft rescue and fire-fighting (ARFF) services at airports. Requirements for other airport fire protection services are not covered in this document.

1.2 Purpose.

1.2.1 This standard is prepared for the use and guidance of those charged with providing and maintaining aircraft rescue and fire-fighting services at airports.

1.2.2 The principal objective of a rescue and fire-fighting service is to save lives. For this reason, the preparation for dealing with an aircraft accident or incident occurring at, or in the immediate vicinity of, an airport is of primary importance because it is within this location that the greatest opportunity to save lives exists. The possibility of, and need for, extinguishing a fire that can occur either immediately following an aircraft accident or incident, or at any time during rescue operations, must be assumed at all times.

1.2.3 The most important factors bearing on effective rescue in a survivable aircraft accident are the training received, the effectiveness of the equipment, and the speed with which personnel and equipment designated for rescue and fire-fighting purposes can be put to use.

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, P.O. Box 9101, Quincy, MA 02269-9101.

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

NFPA 412, *Standard for Evaluating Aircraft Rescue and Fire-Fighting Foam Equipment*, 2003 edition.

NFPA 414, *Standard for Aircraft Rescue and Fire-Fighting Vehicles*, 2001 edition.

NFPA 1003, *Standard for Airport Fire Fighter Professional Qualifications*, 2000 edition.

2.3 Other Publications.

2.3.1 Military Specification. Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

U.S. Military Specification MIL-F-24385, *Fire Extinguishing Agent, Aqueous Film-Forming Foam (AFFF), Liquid Concentrate, for Fresh and Sea Water*, Revision F, January 7, 1992.

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

UL 162, *Standard for Foam Equipment and Liquid Concentrates*, 6th edition, March 7, 1989.

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 included, common usage of the terms shall apply.

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 Shall. Indicates a mandatory requirement.

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

3.3 General Definitions.

3.3.1 ARFF Personnel. Personnel actively engaged in the pursuit of rescue and fire-fighting at the scene of an airport incident.

3.3.2 Actual Response Time. The total period of time measured from the time of an alarm until the first ARFF vehicle arrives at the scene of an aircraft accident and is in position to apply agent.

3.3.3 Aircraft Accident. An occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight and until all such persons have disembarked and in which any person suffers death or serious injury or in which the aircraft receives substantial damage.

3.3.4 Aircraft Fire Fighting. The control or extinguishment of fire adjacent to or involving an aircraft following ground accidents or incidents. Aircraft fire fighting does not include the control or extinguishment of airborne fires in aircraft.

3.3.5 Aircraft Incident. An occurrence, other than an accident, associated with the operation of an aircraft, that affects or could affect continued safe operation if not corrected. An incident does not result in serious injury to persons or substantial damage to the aircraft.

3.3.6 Aircraft Rescue. The fire-fighting action taken to prevent, control, or extinguish fire involving, or adjacent to, an aircraft for the purpose of providing maximum fuselage integrity and escape area for its occupants. Rescue and fire-fighting personnel, to the extent possible, will assist in evacuation of the aircraft using normal and emergency means of egress. Additionally, rescue and fire-fighting personnel will, by whatever means necessary, and to the extent possible, enter the aircraft and provide all possible assistance in the evacuation of the occupants.

3.3.7 Airport Air Traffic Control. A service established to provide air and ground traffic control for airports.

3.3.8 Airport Fire Chief. The individual normally having operational control over the airport's rescue and fire-fighting personnel and equipment, or a designated appointee.

3.3.9 Airport Fire Department Personnel. Personnel under the operational jurisdiction of the chief of the airport fire department assigned to aircraft rescue and fire fighting.

3.3.10 Airport Manager. The individual having managerial responsibility for the operation and safety of an airport. The manager can have administrative control over aircraft rescue and fire-fighting services, but normally does not exercise authority over operational fire and rescue matters.

3.3.11 Area Classifications.

3.3.11.1 Critical Rescue and Fire-Fighting Access Area (CRFFAA). The rectangular area surrounding any runway within which most aircraft accidents can be expected to occur on airports. Its width extends 500 ft (150 m) from each side of the runway centerline and its length is 3300 ft (1000 m) beyond each runway end. (See Figure A.3.3.11.3.)

3.3.11.2 Movement Area. That part of an airport to be used for the take-off, landing and taxiing of aircraft, and the apron(s).

3.3.11.3* Rapid Response Area (RRA). A rectangle that includes the runway and the surrounding area extending to but not beyond the airport property line. Its width extends 500 ft (150 m) outward from each side of the runway centerline, and its length is 1650 ft (500 m) beyond each runway end. (See Figure A.3.3.11.3.)

3.3.12 Fixed Base Operator (FBO). An enterprise based on an airport that provides storage, maintenance, or service for aircraft operators.

3.3.13 Flight Service Station (FSS). An air traffic facility that briefs pilots, processes, and monitors flight plans, and provides in-flight advisories.

3.3.14 Foam. An aggregation of small bubbles used to form an air-excluding, vapor-suppressing blanket over the surface of a flammable liquid fuel.

3.3.14.1 Aqueous Film-Forming Foam (AFFF). A concentrated aqueous solution of one or more hydrocarbon and/or fluorochemical surfactants that forms a foam capable of producing a vapor-suppressing, aqueous film on the surface of hydrocarbon fuels. The foam produced from AFFF concentrates is dry chemical compatible and, therefore, is suitable for use in combination with that agent.

3.3.14.2 Film-Forming Fluoroprotein Foam (FFFP). A protein-based foam concentrate incorporating fluorinated surfactants that forms a foam capable of producing a vapor-suppressing, aqueous film on the surface of hydrocarbon

fuels. This foam might show an acceptable level of compatibility to dry chemicals and might be suitable for use with those agents.

3.3.14.3 Fluoroprotein Foam (FP). A protein-based foam concentrate with added fluorochemical surfactants that forms a foam showing a measurable degree of compatibility with dry chemical extinguishing agents and an increase in tolerance to contamination by fuel.

3.3.14.4 Protein Foam (P). A protein-based foam concentrate that is stabilized with metal salts to make a fire-resistant foam blanket.

3.3.15 Foam Concentrate. A concentrated liquid foaming agent that is mixed with water and air in designated proportions to form foam.

3.3.16 Fuselage. The main body of an aircraft.

3.3.17 International Civil Aviation Organization (ICAO). An international body charged with matters dealing with the development, coordination, and preservation of international civil aviation.

3.3.18 Mutual Aid. Reciprocal assistance by emergency services under a prearranged plan.

3.3.19 Table-Top Training. A workshop style of training involving a realistic emergency scenario and requiring problem-solving participation by personnel responsible for management and support at emergencies.

Chapter 4 Organization of Aircraft Rescue and Fire-Fighting (ARFF) Services

4.1 Administrative Responsibilities.

4.1.1 The airport management shall be responsible for the provisions of ARFF services on the airport.

4.1.2 Regardless of the functional control of ARFF services on the airport, a high degree of mutual aid shall be prearranged between such services on airports and any off-airport fire or rescue agencies serving the environs of the airport.

4.1.3 The aircraft owner or operator shall ensure that provisions have been made for the security of the aircraft until such time as a legally appointed accident investigation authority assumes responsibility. The airport manager or authority having jurisdiction can assist or assume the authority in the absence of the aircraft owner or operator.

4.2* Emergency Preparedness. The airport shall develop a risk management plan for fire emergency scene strategy.

4.2.1 Airports shall prepare and maintain in current status an airport/community emergency plan. The plan shall assign specific duties and responsibilities and include all airport and community resources necessary to cope with a major aircraft emergency.

4.2.2* Airport/community emergency plans shall be tested at least every two years in the form of a full-scale exercise. In addition, table-top training shall be conducted at least annually.

4.2.3 Airport management and resource agencies shall participate in annual table-top training exercises that encompass their duties and responsibilities depicted in the emergency plan.

4.3 Categorizing Airports for ARFF Services.

4.3.1 The authority having jurisdiction shall determine the level of protection based on the largest aircraft scheduled into the airport. Airports shall be categorized for ARFF services in accordance with Table 4.3.1. (See Annex B.)

Table 4.3.1 Airport Category by Overall Length and Width of Aircraft

Airport Category U.S.			Overall Length of Aircraft up to but Not Including		Maximum Exterior Width up to but Not Including	
NFPA	FAA	ICAO	m	ft	m	ft
1	GA-1	1	9	30	2	6.6
2	GA-1	2	12	39	2	6.6
3	GA-2	3	18	59	3	9.8
4	A	4	24	78	4	13.0
5	A	5	28	90	4	13.0
6	B	6	39	126	5	16.4
7	C	7	49	160	5	16.4
8	D	8	61	200	7	23.0
9	E	9	76	250	7	23.0
10		10	90	295	8	25.0

Notes:

1. Airport categories are used in the calculations to eliminate the need for calculating specific quantities of extinguishing agents for each type of aircraft.
2. Although only water is normally necessary for interior handline attack, logistically and tactically it should be discharged as foam and is therefore included in the quantities of water necessary for foam production in Tables 5.3.1(a) and 5.3.1(b).

4.3.2* The airport category for a given aircraft shall be based on the overall length of the aircraft or the fuselage width. If, after selecting the category appropriate to the aircraft's overall length, the aircraft's fuselage width is greater than the maximum width given in Table 4.3.1, then the category for that aircraft shall be the next one higher.

Chapter 5 Extinguishing Agents

5.1 Primary Agents.

5.1.1* One or more of the following types of primary agents shall be used for aircraft fire fighting involving hydrocarbon fuels:

- (1) Aqueous film-forming foams (AFFF)
- (2) Fluoroprotein foam (FP) or film-forming fluoroprotein foam (FFFP)
- (3) Protein foam (P)

5.1.2* All foam concentrates shall be listed based on the following performance test requirements.

5.1.2.1* Aqueous film-forming foam agents shall meet the requirements of U.S. Military Specification MIL-F-24385.

5.1.2.2 Film-forming fluoroprotein foam (FFFP), protein foam (P), and fluoroprotein foam (FP) agents shall meet the applicable fire extinguishment and burnback performance requirements of Underwriters Laboratories Inc. Standard UL 162 (Type 3 application).

5.1.2.3 Any primary agent used at the minimum quantities and discharge rates for AFFF in Table 5.3.1(a) and Table 5.3.1(b) shall meet the applicable fire extinguishment and burnback performance requirements of 5.1.2.1.

5.2 Complementary Agents. All ARFF vehicles responding shall carry either one or both of the following categories of complementary agents:

- (1)* Potassium bicarbonate or potassium bicarbomate dry chemical
- (2)* Halogenated agent

5.3 Quantity of Agents.

5.3.1* The minimum amounts of water for foam production and the minimum amounts of complementary agents necessary shall be as specified in Table 5.3.1(a) or Table 5.3.1(b), based on the system of categorizing airports listed in Table 4.3.1.

5.3.2 Sufficient foam concentrate shall be provided on each vehicle to proportion, at the prescribed percentage of foam concentrate to water, into double the quantity of water specified in Table 5.3.1(a) or Table 5.3.1(b) at the maximum tolerance specified in NFPA 412.

5.3.3* Water equal to 100 percent of that required by 5.3.1 shall be available to replenish the primary fire-fighting vehicle(s).

5.4* Compatibility of Agents. Chemical compatibility shall be ensured between foam and complementary agents where used simultaneously or consecutively.

5.5* Combustible Metal Agents. Extinguishing agents for combustible metal fires shall be provided in portable fire extinguishers that are rated for Class D fires in accordance with Section 1.3 of NFPA 10. At least one nominal 20-lb (9.1-kg) extinguisher shall be carried on each vehicle specified in Table 6.1.1.

5.6 Agent Discharge Capabilities.

5.6.1 The discharge capabilities of extinguishing agents shall not be less than the rates specified in Table 5.3.1(a) or Table 5.3.1(b) of this standard and Tables 4.1.1(c) and 4.1.1(d) of NFPA 414.

5.6.2 Other than at Category 1 and 2 airports, where the handline nozzles can be used, the discharge rates for foam shall be met using only the ARFF vehicle turret(s).

Table 5.3.1(a) Extinguishing Agents, Discharge and Response Capability in SI Units

Airport Category	Response Phases	Response Capability (sec)	AFFF		Fluoroprotein or FFFP		Protein Foam		Complementary Agents ⁽⁴⁾	
			Required Water (L)	Discharge Capability (L/min)	Required Water (L)	Discharge Capability (L/min)	Required Water (L)	Discharge Capability (L/min)	Quantity (kg)	Discharge (kg/sec)
1	Q1 ⁽¹⁾	120	450	450	600	600	700	700	45	2.25
	Q2 ⁽²⁾		0		0		0			
	Q3 ⁽³⁾		0		0		0			
	TOTAL		450		600		700			
2	Q1 ⁽¹⁾	120	591	591	787	787	906	906	90	2.25
	Q2 ⁽²⁾	180	159		213		244			
	Q3 ⁽³⁾		0		0		0			
	TOTAL		750		1,000		1,150			
3	Q1 ⁽¹⁾	120	1,077	1,077	1,500	1,500	1,692	1,692	135	2.25
	Q2 ⁽²⁾	180	323		450		508			
	Q3 ⁽³⁾	240	1,100	110	1,100	110	1,100	110		
	TOTAL		2,500		3,050		3,300			
4	Q1 ⁽¹⁾	120	1,772	1,772	2,468	2,468	2,722	2,722	135	2.25
	Q2 ⁽²⁾	180	1,028		1,432		1,578			
	Q3 ⁽³⁾	240	2,250	225	2,250	225	2,250	225		
	TOTAL		5,050		6,150		6,550			
5	Q1 ⁽¹⁾	120	3,257	3,257	4,514	4,514	5,029	5,029	205	2.25
	Q2 ⁽²⁾	180	2,443		3,386		3,771			
	Q3 ⁽³⁾	240	4,750	475	4,750	475	4,750	475		
	TOTAL		10,450		12,650		13,550			
6	Q1 ⁽¹⁾	120	4,700	4,700	6,525	6,525	7,250	7,250	205	2.25
	Q2 ⁽²⁾	180	4,700		6,525		7,250			
	Q3 ⁽³⁾	240	4,750	475	4,750	475	4,750	475		
	TOTAL		14,150		17,800		19,250			
7	Q1 ⁽¹⁾	120	5,983	5,983	8,297	8,297	9,214	9,214	205	2.25
	Q2 ⁽²⁾	180	7,717		10,703		11,886			
	Q3 ⁽³⁾	240	4,750	475	4,750	475	4,750	475		
	TOTAL		18,450		23,750		25,850			
8	Q1 ⁽¹⁾	120	7,937	7,937	10,992	10,992	12,202	12,202	410	4.5
	Q2 ⁽²⁾	180	12,063		16,708		18,548			
	Q3 ⁽³⁾	240	9,450	945	9,450	945	9,450	945		
	TOTAL		29,450		37,150		40,200			
9	Q1 ⁽¹⁾	120	9,907	9,907	13,722	13,722	15,259	15,259	410	4.5
	Q2 ⁽²⁾	180	16,843		23,328		25,941			
	Q3 ⁽³⁾	240	9,450	945	9,450	945	9,450	945		
	TOTAL		36,200		46,500		50,650			
10	Q1 ⁽¹⁾	120	12,103	12,103	16,759	16,759	18,603	18,603	410	4.5
	Q2 ⁽²⁾	180	22,997		31,841		35,347			
	Q3 ⁽³⁾	240	18,900	1,890	18,900	1,890	18,900	1,890		
	TOTAL		54,000		67,500		72,850			

(1) Quantity of water for foam production for initial control of the pool fire.

(2) Quantity of water for foam production to continue control or fully extinguish the pool fire.

(3) Water for interior fire fighting. Discharge at the interior shall be available in the prescribed time.

(4) The minimum quantity is based on ISO qualified Potassium Bicarbonate. Powder can be substituted by a listed agent exceeding the performance of Potassium Bicarbonate.

Table 5.3.1(b) Extinguishing Agents, Discharge and Response Capability in U.S. Customary Units

Airport Category	Response Phases	Response Capability (sec)	AFFF		Fluoroprotein or FFFP		Protein Foam		Complementary Agents ⁽⁴⁾	
			Required Water (U.S. gal)	Discharge Capability (gpm)	Required Water (U.S. gal)	Discharge Capability (gpm)	Required Water (U.S. gal)	Discharge Capability (gpm)	Quantity (lb)	Discharge (lb/sec)
1	Q1 ⁽¹⁾	120	120	120	160	160	180	180	100	5
	Q2 ⁽²⁾		0		0		0			
	Q3 ⁽³⁾		0		0		0			
	TOTAL		120		160		180			
2	Q1 ⁽¹⁾	120	157	157	213	213	236	236	200	5
	Q2 ⁽²⁾	180	43		57		64			
	Q3 ⁽³⁾		0		0		0			
	TOTAL		200		270		300			
3	Q1 ⁽¹⁾	120	285	285	392	392	438	438	300	5
	Q2 ⁽²⁾	180	85		118		132			
	Q3 ⁽³⁾	240	300	60	300	60	300	60		
	TOTAL		670		810		870			
4	Q1 ⁽¹⁾	120	468	468	646	646	715	715	300	5
	Q2 ⁽²⁾	180	272		374		415			
	Q3 ⁽³⁾	240	600	60	600	60	600	60		
	TOTAL		1,340		1,620		1,730			
5	Q1 ⁽¹⁾	120	863	863	1,194	1,194	1,331	1,331	450	5
	Q2 ⁽²⁾	180	647		896		999			
	Q3 ⁽³⁾	240	1,250	125	1,250	125	1,250	125		
	TOTAL		2,760		3,340		3,580			
6	Q1 ⁽¹⁾	120	1,245	1,245	1,725	1,725	1,920	1,920	450	5
	Q2 ⁽²⁾	180	1,245		1,725		1,920			
	Q3 ⁽³⁾	240	1,250	125	1,250	125	1,250	125		
	TOTAL		3,740		4,700		5,090			
7	Q1 ⁽¹⁾	120	1,585	1,585	2,192	2,192	2,437	2,437	450	5
	Q2 ⁽²⁾	180	2,045		2,828		3,143			
	Q3 ⁽³⁾	240	1,250	125	1,250	125	1,250	125		
	TOTAL		4,880		6,270		6,830			
8	Q1 ⁽¹⁾	120	2,095	2,095	2,901	2,901	3,222	3,222	900	10
	Q2 ⁽²⁾	180	3,185		4,409		4,898			
	Q3 ⁽³⁾	240	2,500	250	2,500	250	25,00	250		
	TOTAL		7,780		9,810		10,620			
9	Q1 ⁽¹⁾	120	2,619	2,619	3,626	3,626	4,030	4,030	900	10
	Q2 ⁽²⁾	180	4,451		6,164		6,850			
	Q3 ⁽³⁾	240	2,500	250	2,500	250	2,500	250		
	TOTAL		9,570		12,290		13,380			
10	Q1 ⁽¹⁾	120	3,195	3,195	4,424	4,424	4,915	4,915	900	10
	Q2 ⁽²⁾	180	6,069		8,405		9,338			
	Q3 ⁽³⁾	240	5,000	500	5,000	500	5,000	500		
	TOTAL		14,260		17,830		19,250			

(1) Quantity of water for foam production for initial control of the pool fire.

(2) Quantity of water for foam production to continue control or fully extinguish the pool fire.

(3) Water for interior fire fighting. Discharge at the interior shall be available in the prescribed time.

(4) The minimum quantity is based on ISO qualified Potassium Bicarbonate. Powder can be substituted by a listed agent exceeding the performance of Potassium Bicarbonate.