NFPA® 403

Standard for Aircraft Rescue and Fire-Fighting Services at Airports

2009 Edition

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NFPA® 403

Standard for

Aircraft Rescue and Fire-Fighting Services at Airports

2009 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. It was issued by the Standards Council on July 24, 2008, with an effective date of September 5, 2008, and supersedes all previous editions.

This edition of NFPA 403 was approved as an American National Standard on September 5, 2008.

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 (USA) 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. 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 the 2003 edition was the addition of staffing requirements.

The 2009 edition has modified some definitions. Additional cleanup of the document was made by moving nonmandatory language to Annex A. The FAA Airport Category column in Table 4.3.1 has been updated.

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Technical Committee on Aircraft Rescue and Fire Fighting

Donald R. Austin, Los Angeles City Fire Department, CA [U]
Keith W. Bagot, U.S. Federal Aviation Administration, NJ [RT]
Alan Black, Dallas/Fort Worth Airport Board, TX [C]
Rep. Airports Council International–North America
Ralph Colet, JRI Inc., CA [M]
Robert L. Darwin, Hughes Associates, Inc., MD [SE]
Ross A. Davidson, U.S. Department of the Navy, CA [C]
John Demyan, Lehigh-Northampton Airport Authority, PA [L]
Rep. International Association of Fire Fighters
Owen Healey, United Kingdom Civil Aviation Authority, United Kingdom [E]
Donald E. Hilderbrand, Phoenix Fire Department, AZ [U]
L. M. Krasner, FM Global, MA [I]
Robert G. Lindstrom, Pro-Tec Fire Services Ltd., OK [U]
Rep. International Association of Fire Chiefs
Paul S. Meyer, Hartsfield Atlanta International Airport, GA [C]
Gary I. Moorshead, BAA Ltd., United Kingdom [C]
Gaétan Morinville, National Defence Department, Canada, Canada [C]
Kevin J. Petit, Akron Brass Company, OH [M]
Pam L. Phillips, Port Authority of New York & New Jersey, NY [C]
Rep. American Association of Airport Executives
Lawrence V. Powers, Plymouth, MA [SE]
Richard M. Radford, Department of Civil Aviation, United Arab Emirates [U]
Rick Salivia, Air Line Pilots Association, International, TX [L]
Gary T. Schott, Omaha Airport Authority, NE [L]
Rep. Aircraft Rescue & Fire Fighting Working Group
Terry Seaborn, Oshkosh Truck Corporation, WI [M]
Robert L. Shaub, Emergency One, Inc., FL [M]
Marc S. Tonnacliff, U.S. Federal Aviation Administration, DC [E]
Bernard Valois, Transport Canada Civil Aviation, Canada [E]
Joseph A. Wright, ARFF Technical Services, Inc., PA [SE]

Alternates

Abdulrahman A. Y. Alsaadi, Department of Civil Aviation, United Arab Emirates [U]
(Alt. to R. M. Radford)
Robert J. Donahue, Massport Fire-Rescue, MA [L]
(Alt. to Massport Rep.)
David Evans DeMaria, U.S. Federal Aviation Administration, DC [E]
(Alt. to M. S. Tonacliff)
Eric J. Gogley, U.S. Department of the Navy, CA [C]
(Alt. to R. A. Davidson)
David D. Harris, Lockheed Martin Aeronautics Company, GA [U]
(Voting Alt. to Lockheed Martin Rep.)
Madhu Manikkam, Emergency One, Inc., FL [M]
(Alt. to R. L. Shaub)
Harold D. Miller, Atlanta Fire Department, GA [C]
(Alt. to P. S. Meyer)
James F. O'Regan, O'Regan Consulting/JRI, Inc., MA [M]
(Alt. to R. Colet)
Ron Parry, BAA plc, United Kingdom [C]
(Alt. to G. I. Moorshead)
Joseph L. Scheffey, Hughes Associates, Inc., MD [SE]
(Alt. to R. L. Darwin)
Nicholas M. Subbotin, U.S. Federal Aviation Administration, NJ [RT]
(Alt. to K. W. Bagot)
Pierre Voisine, National Defence Department, Canada, Canada [C]
(Alt. to G. Morinville)

Nonvoting

B. Victor Hewes, Airport Safety Services, GA [SE]
(Member Emeritus)
Thomas J. Lett, Albuquerque Fire & Safety Associates, NM [SE]
(Member Emeritus)
Francois Villard, Fire Safety Security Crisis Management Training, Switzerland [SE]

Richard P. Bielen, NFPA Staff Liaison

This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.

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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Standard for

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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.

1.3 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

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,* 2007 edition.

NFPA 412, *Standard for Evaluating Aircraft Rescue and Fire-Fighting Foam Equipment,* 2009 edition.

NFPA 414, *Standard for Aircraft Rescue and Fire-Fighting Vehicles,* 2007 edition.

NFPA 1003, *Standard for Airport Fire Fighter Professional Qualifications,* 2005 edition.

2.3 Other Publications.

2.3.1 Military Specification Publications. 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 Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

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

2.3.3 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 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.

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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. Action taken to save or set free persons involved in an aircraft incident/accident by safeguarding the integrity of the aircraft fuselage from an external/internal fire, to support self-evacuation, and to undertake the removal of injured and trapped persons.

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. *(See Figure A.3.3.11.3.)*

3.3.11.2 ***Movement Area.*** That part of an airport to be used for the takeoff, 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 a width of 500 ft (150 m) outward from each side of the runway centerline and to a length of 1650 ft (500 m) beyond each runway end, but not beyond the airport property line. *(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.

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.

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

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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, tabletop training shall be conducted at least annually.

4.2.3 Airport management and resource agencies shall participate in annual tabletop 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	A*	1	9	30	2	6.6
2	A*	2	12	39	2	6.6
3	A*	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 Table 5.3.1(a) and Table 5.3.1(b).
* It is FAA Category A if the airport has scheduled service with aircraft that have more than nine passenger seats.

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, *Fire Extinguishing Agent, Aqueous Film-Forming Foam (AFFF), Liquid Concentrate for Fresh and Sea Water.*

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, *Standard for Foam Equipment and Liquid Concentrates* (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 bicarbonate 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, *Standard for Evaluating Aircraft Rescue and Fire-Fighting Foam Equipment.*

5.3.3* Each airport shall conduct and document a needs analysis to determine a minimum 100 percent water resupply capability within the critical rescue and fire-fighting access area and shall ensure that local arrangements fulfill that capability.

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 5.2.4 of NFPA 10, *Standard for Portable Fire Extinguishers.* 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 Table 4.1.1(c) and Table 4.1.1(d) of NFPA 414, *Standard for Aircraft Rescue and Fire-Fighting Vehicles.*

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

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

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

[a]The minimum quantity is based on ISO qualified potassium bicarbonate. Powder can be substituted by a listed agent exceeding the performance of potassium bicarbonate.
[b]Quantity of water for foam production for initial control of the pool fire.
[c]Quantity of water for foam production to continue control or fully extinguish the pool fire.
[d]Water available for interior fire fighting.

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

Airport Category	Response Phases	Response Capability (sec)	AFFF Required Water (U.S. gal)	AFFF Discharge Capability (gpm)	Fluoroprotein or FFFP Required Water (U.S. gal)	Fluoroprotein or FFFP Discharge Capability (gpm)	Protein Foam Required Water (U.S. gal)	Protein Foam Discharge Capability (gpm)	Complementary Agents[a] Quantity (lb)	Complementary Agents[a] Discharge (lb/sec)
1	Q1[b]	120	120	120	160	160	180	180	100	5
	Q2[c]		0		0		0			
	Q3[d]		0		0		0			
TOTAL			**120**		**160**		**180**			
2	Q1[b]	120	157	157	213	213	236	236	200	5
	Q2[c]	180	43		57		64			
	Q3[d]		0		0		0			
TOTAL			**200**		**270**		**300**			
3	Q1[b]	120	285	285	392	392	438	438	300	5
	Q2[c]	180	85		118		132			
	Q3[d]	240	300	60	300	60	300	60		
TOTAL			**670**		**810**		**870**			
4	Q1[b]	120	468	468	646	646	715	715	300	5
	Q2[c]	180	272		374		415			
	Q3[d]	240	600	60	600	60	600	60		
TOTAL			**1,340**		**1,620**		**1,730**			
5	Q1[b]	120	863	863	1,194	1,194	1,331	1,331	450	5
	Q2[c]	180	647		896		999			
	Q3[d]	240	1,250	125	1,250	125	1,250	125		
TOTAL			**2,760**		**3,340**		**3,580**			
6	Q1[b]	120	1,245	1,245	1,725	1,725	1,920	1,920	450	5
	Q2[c]	180	1,245		1,725		1,920			
	Q3[d]	240	1,250	1,25	1,250	125	1,250	125		
TOTAL			**3,740**		**4,700**		**5,090**			
7	Q1[b]	120	1,585	1,585	2,192	2,192	2,437	2,437	450	5
	Q2[c]	180	2,045		2,828		3,143			
	Q3[d]	240	1,250	125	1,250	125	1,250	125		
TOTAL			**4,880**		**6,270**		**6,830**			
8	Q1[b]	120	2,095	2,095	2,901	2,901	32,22	3,222	900	10
	Q2[c]	180	3,185		4,409		4,898			
	Q3[d]	240	2,500	250	2,500	250	25,00	250		
TOTAL			**7,780**		**9,810**		**10,620**			
9	Q1[b]	120	2,619	2,619	3,626	3,626	4,030	4,030	900	10
	Q2[c]	180	4,451		6,164		6,850			
	Q3[d]	240	2,500	250	2,500	250	2,500	250		
TOTAL			**9,570**		**12,290**		**13,380**			
10	Q1[b]	120	3,195	3,195	4,424	4,424	4,915	4,915	900	10
	Q2[c]	180	6,069		8,405		9,338			
	Q3[d]	240	5,000	500	5,000	500	5,000	500		
TOTAL			**14,260**		**17,830**		**19,250**			

[a]The minimum quantity is based on ISO qualified potassium bicarbonate. Powder can be substituted by a listed agent exceeding the performance of potassium bicarbonate.
[b]Quantity of water for foam production for initial control of the pool fire.
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