NFPA® 1003

Standard for Airport Fire Fighter Professional Qualifications

2010 Edition

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

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ISBN: 978-087765947-1 (Print)
ISBN: 978-087765995-2 (PDF) 12/09

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NFPA® 1003

Standard for

Airport Fire Fighter Professional Qualifications

2010 Edition

This edition of NFPA 1003, *Standard for Airport Fire Fighter Professional Qualifications*, was prepared by the Technical Committee on Fire Fighter Professional Qualifications and released by the Technical Correlating Committee on Professional Qualifications. It was issued by the Standards Council on October 27, 2009, with an effective date of December 5, 2009, and supersedes all previous editions.

This edition of NFPA 1003 was approved as an American National Standard on December 5, 2009.

Origin and Development of NFPA 1003

In 1972, the Joint Council of National Fire Service Organizations (JCNFSO) created the National Professional Qualifications Board for the Fire Service (NPQB) to facilitate the development of nationally applicable performance standards for uniformed fire service personnel. On December 14, 1972, the Board established four technical committees to develop those standards using the National Fire Protection Association (NFPA) standards-making system. The initial committees addressed the following career areas: fire fighter, fire officer, fire service instructor, and fire inspector and investigator.

The Committee on Fire Fighter Professional Qualifications met regularly from 1976 to 1978 to produce the first edition of this document. Adopted by the Association in 1978, NFPA 1003 was the third in the series of fire fighter professional qualifications standards.

The original concept of the professional qualification standards, as directed by the JCNFSO and the NPQB, was to develop an interrelated set of performance standards specifically for the fire service. The various levels of achievement in the standards were to build upon each other within a strictly defined career ladder. In the late 1980s, revisions of the standards recognized that the documents should stand on their own merit in terms of job performance requirements for a given field. Accordingly, the strict career ladder concept was abandoned, except for the progression from fire fighter to fire officer. The later revisions, therefore, facilitated the use of the documents by other than the uniformed fire services.

In 1990, responsibility for the appointment of professional qualifications committees and the development of the professional qualifications standards was assumed by NFPA. The Correlating Committee for Professional Qualifications Standards was appointed by the NFPA Standards Council in 1990 and assumed the responsibility for coordinating the requirements of all of the professional qualifications documents.

The intent of the technical committee was to develop clear and concise job performance requirements that can be used to determine that an individual, when measured to the standard, possesses the skills and knowledge to perform as an airport fire fighter. The committee further contends that these job performance requirements can be used in any fire department in any city, town, or private organization throughout North America.

Changes in the standard for the 2005 edition included the requirement that for certification as an airport fire fighter, the candidate meet the requirements for Fire Fighter II defined in NFPA 1001, *Standard for Fire Fighter Professional Qualifications*.

The 2005 edition also included changes to bring the standard into conformance with the *Manual of Style for NFPA Technical Committee Documents*. The Technical Committee would like to thank the members of the Airport Fire Fighter Task Group who provided them with valuable time and expertise in the development of this document. These individuals are Hugh Pike, Chair; Kenneth Gilliam; Jim Goodbread; Don Hilderbrand; Jim Hotell; Bob Lindstrom; Greg Ranard; and Gary Schott.

For the 2010 edition, a job-task analysis was completed by the committee to ensure that all the requirements were still relevant given the ever-changing world of ARFF. In addition, the committee, as directed by the Technical Correlating Committee, replaced the term *certified* with the term *qualified*. The committee has also added a skills maintenance requirement for ARFF personnel. The most significant change in this edition is the elimination of proximity personal protective equipment (PrPPE) from the minimum requirements. By setting the minimum at PrPPE, the standard had eliminated the ability of the AHJ to decide, given varying situations, whether PPE was acceptable versus PrPPE. The committee also removed Annex B from the document because it determined that the annex would be better served in a document that was relevant to training, which this standard is not.

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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 the management of the NFPA Professional Qualifications Project and documents related to professional qualifications for fire service, public safety, and related personnel.

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Committee Scope: This Committee shall have primary responsibility for documents on professional competence required of fire fighters.

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Standard for

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2010 Edition

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet (•) between the paragraphs that remain.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex C. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

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

Chapter 1 Administration

1.1 Scope. This standard identifies the minimum job performance requirements for the airport fire fighter who is responsible for aircraft rescue and fire fighting.

1.2 Purpose.

1.2.1 The purpose of this standard is to specify the minimum job performance requirements for service as an airport fire fighter.

1.2.2 It is not the intent of this standard to restrict any jurisdiction from exceeding these minimum requirements.

1.3 Units.

1.3.1 In this standard, metric values for measurement are followed by an equivalent in U.S. units. Either set of values can be used, but the same set of values (either metric or U.S. units) shall be used throughout.

1.3.2 Conversion values for SI units and U.S. units are found in Table 1.3.2.

Table 1.3.2 Conversions

Quantity	SI Unit	U.S. Unit	Conversion Factor
Length	millimeter (mm)	inch (in.)	1 in. = 25.4 mm
	meter (m)	foot (ft)	1 ft = 0.305 m
Area	square meter (m^2)	square foot (ft^2)	1 ft^2 = 0.0929 m^2

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 1001, *Standard for Fire Fighter Professional Qualifications,* 2008 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program,* 2007 edition.

2.3 Other Publications.

2.3.1 IATA Publications. International Air Transport Association, IATA Building, 2000 Peel Street, Montreal, Canada H3A 2R4.

Dangerous Goods Manual/Regulations, 1996.

2.3.2 Other Publications.

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

2.4 References for Extracts in Mandatory Sections.

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

NFPA 402, *Guide for Aircraft Rescue and Fire-Fighting Operations,* 2008 edition.

NFPA 403, *Standard for Aircraft Rescue and Fire-Fighting Services at Airports,* 2009 edition.

NFPA 1000, *Standard for Fire Service Professional Qualifications Accreditation and Certification Systems,* 2006 edition.

NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications,* 2009 edition.

NFPA 1031, *Standard for Professional Qualifications for Fire Inspector and Plan Examiner,* 2009 edition.

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 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 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. [**403,** 2009]

3.3.2 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 aircraft. [**402,** 2008]

3.3.3 Airport Fire Fighter. The Fire Fighter II who has demonstrated the skills and knowledge necessary to function as an integral member of an aircraft rescue and fire-fighting (ARFF) team.

3.3.4 Critical Rescue and Fire-Fighting Access Area. The rectangular area surrounding any runway within which most aircraft accidents can be expected to occur on airports. Its width extends 150 m (500 ft) from each side of the runway centerline, and its length is 1000 m (3300 ft) beyond each runway end. [**402,** 2008]

3.3.5 Dangerous Goods. Articles or substances that are capable of posing a significant risk to health, safety, or property when transported by air and that are classified and outlined in the International Air Transport Association (IATA) Dangerous Goods Manual/Regulations.

3.3.6 Fire Department. An organization providing rescue, fire suppression, and related activities, including any public, governmental, private, industrial, or military organization engaging in this type of activity. [**1002,** 2009]

3.3.7* Hazardous Area. For an aircraft, the area inside 23 m (75 ft) from any external surface of the aircraft.

3.3.8 Job Performance Requirement (JPR). A statement that describes a specific job task, lists the items necessary to complete the task, and defines measurable or observable outcomes and evaluation areas for the specific task. [**1000,** 2006]

3.3.9* National Defense Area. An area established on nonfederal lands located in the United States, its territories, or its possessions for the purpose of safeguarding classified defense information or protecting Department of Defense (DOD) equipment, material, or both.

3.3.10* Personal Protective Equipment. Consists of full personal protective clothing, plus a self-contained breathing apparatus (SCBA) and personal alert safety system (PASS) device. [***101,*** 2008]

3.3.11 Practical Critical Fire Area (PCA). This area is two-thirds of the Theoretical Critical Fire Area (TCA). [**402,** 2008] *(See also 3.3.15, Theoretical Critical Fire Area.)*

3.3.12 Requisite Knowledge. Fundamental knowledge one must have in order to perform a specific task. [**1031,** 2009]

3.3.13 Requisite Skills. The essential skills one must have in order to perform a specific task. [**1031,** 2009]

3.3.14 Task. A specific job behavior or activity. [**1002,** 2009]

3.3.15* Theoretical Critical Fire Area (TCA). The theoretical critical fire area (TCA) is a rectangle, the longitudinal dimension of which is the overall length of the aircraft, and the width includes the fuselage and extends beyond it by a predetermined set distance that is dependent on the overall width. Therefore, the aircraft length multiplied by the calculated width equals the size of the TCA. [**402,** 2008]

3.3.16 Zone. One of the sections of an area created for a particular purpose.

3.3.16.1* *Cold Zone.* The hazard-free area around an incident.

3.3.16.2* *Hot Zone.* The control zone immediately surrounding a hazardous materials incident that extends far enough to prevent adverse effects from hazardous materials releases to personnel outside the zone.

3.3.16.3* *Warm Zone.* The control zone at a hazardous materials incident site where personnel and equipment decontamination and hot zone support takes place.

Chapter 4 General Requirements

4.1* Certification. To be qualified as an airport fire fighter, the candidate shall meet the requirements for Fire Fighter II as defined in NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, and the requirements for airport fire fighter defined in this standard.

4.2 Safety.

4.2.1 Candidates shall safely complete job performance requirements in accordance with recognized practices and procedures.

4.2.2 Candidates also shall meet all applicable occupational safety and health requirements of the jurisdiction.

4.3 Job Performance Requirements.

4.3.1 Job performance requirements defined by this standard shall be evaluated by individuals approved by the authority having jurisdiction.

4.3.2 Job performance requirements shall not be required to be mastered in the order in which they appear.

4.3.3 The local, state/provincial, or federal training program shall establish the instructional priority and the training program content to prepare individuals to meet the job performance requirements of this standard.

4.3.4 Job performance requirements involving exposure to products of combustion outside of the aircraft rescue and fire-fighting (ARFF) vehicle shall be performed in PPE.

4.4 Maintenance of Skills and Knowledge.

4.4.1* The airport fire fighter shall remain current with ARFF fire protection technology, ARFF fire suppression practices, and applicable standards as determined by the AHJ.

Chapter 5 Airport Fire Fighter

5.1 General.

5.1.1 Qualifications. To be qualified as an airport fire fighter, the candidate shall meet each of the job performance requirements defined in this chapter.

5.1.1.1 Duties. These requirements shall be divided into three major duties: response, fire suppression, and rescue.

5.1.1.2 Function. The primary function of the airport fire fighter shall be to execute fire suppression and rescue activities.

5.1.1.3* General Knowledge Requirements. Fundamental aircraft fire-fighting techniques, including the approach, positioning, initial attack, and selection, application, and management of the extinguishing agents; limitations of various sized hand lines; use of personal protective equipment (PPE); fire behavior; fire-fighting techniques in oxygen-enriched atmospheres; reaction of aircraft materials to heat and flame; critical components and hazards of civil aircraft construction and systems related to ARFF operations; special hazards associated with military aircraft systems; a national defense area and limitations within that area; characteristics of different aircraft fuels; hazardous areas in and around aircraft; aircraft fueling systems (hydrant/vehicle); aircraft egress/ingress (hatches, doors, and evacuation chutes); hazards associated with aircraft cargo, including dangerous goods; hazardous areas, including entry control points, crash scene perimeters, and requirements for operations within the hot, warm, and cold zones; and critical stress management policies and procedures.

5.1.1.4 General Skills Requirements. Don PPE; operate hatches, doors, and evacuation chutes; approach, position, and initially attack an aircraft fire; select, apply, and manage extinguishing agents; shut down aircraft systems, including engine, electrical, hydraulic, and fuel systems; operate aircraft extinguishing systems, including cargo area extinguishing systems.

5.1.2 The job performance requirements of this chapter shall be accomplished in accordance with the requirements of the authority having jurisdiction and NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.*

5.2 Response. This duty involves the timely arrival at an incident or accident and the capability to perform emergency functions. The duty also includes responding to hazardous conditions and performing standby operations.

5.2.1 Respond to day and night incidents or accidents on and adjacent to the airport, given an assignment, operating conditions, a location, a grid map, a vehicle, and a prescribed response time, so that the route selected and taken provides access to the site within the allotted time.

(A) Requisite Knowledge. Airport familiarization, including runway and taxiway designations, frangible gate locations, airport markings, lights, Instrument Landing System (ILS) critical areas, critical rescue and fire-fighting access areas, designated isolation areas, vehicular traffic controls on airfield, bridge load limits, controlled access points, aircraft traffic patterns and taxi routes, fuel storage and distribution locations, airport and immediate local area topographic layout, drainage systems, water supplies, airport facilities, and security.

(B) Requisite Skills. Read, interpret, and take correct action related to grid maps, water distribution maps, airport markings, and lights.

5.2.2 Communicate critical incident information regarding an incident or accident on or adjacent to an airport, given an assignment involving an incident or accident and an incident management system (IMS) protocol, so that the information provided is accurate and sufficient for the incident commander to initiate an attack plan.

(A) Requisite Knowledge. Incident management system (IMS) protocol, the airport emergency plan, airport and aircraft familiarization, and communications equipment and procedures.

(B) Requisite Skills. Operate communications systems, communicate an accurate situation report, implement incident management system (IMS) protocol and airport emergency plan, and recognize aircraft types.

5.2.3 Communicate with applicable air traffic control facilities, given a response destination on or adjacent to an airport and radio equipment, so that all required clearances are obtained.

(A) Requisite Knowledge. Communications equipment and frequencies, tower light signals, aviation phraseology, and phonetic alphabet.

(B) Requisite Skills. Operate communications equipment and use aviation phraseology and phonetic alphabet.

5.2.4* Perform an airport operation, given an assignment, a hazardous condition, and the airport policies and procedures, so that unsafe conditions are detected and reduced in accordance with the airport policies and procedures.

(A) Requisite Knowledge. Airport and aircraft policies and procedures for hazardous conditions.

(B) Requisite Skills. Recognize hazardous conditions and initiate corrective action.

5.3 Fire Suppression. This duty involves the attack, control, and extinguishment of fires involving aircraft, aircraft cargo, airport facilities, and other equipment related to airport operations and property conservation. The primary purpose of this duty is to protect lives and property.

5.3.1* Extinguish a 23.2 m^2 (250 ft^2) aircraft fuel spill fire, given PPE, a minimum of a 45 kg (100 lb) dry chemical fire extinguisher, and procedures, so that the agent is applied according to procedures and the fire is extinguished in 25 seconds.

(A) Requisite Knowledge. The fire behavior of aircraft fuels in spills and pools, physical properties, characteristics of aircraft fuel, agent application rates, densities, and procedures.

(B) Requisite Skills. Operate dry chemical extinguishers equipped with a hose line, including removing and operating hose and applying agent.

5.3.2* Extinguish an aircraft fuel spill fire, given PPE, an assignment, agent application procedures, an ARFF vehicle hand line flowing a minimum of 359 L/min (95 gpm) of AFFF extinguishing agent, and a fire sized to the flow rate used [AFFF flow rate divided by 4.92 L/min/m^2 for fire size in square meters (0.13 gpm/ft^2 for fire size in square feet)], so that the agent is applied using the prescribed techniques and the fire is extinguished in a time proportionate to, but no longer than, 90 seconds for a 73 m^2 (786 ft^2) fire with a flow rate at 359 L/min (95 gpm).

(A) Requisite Knowledge. The fire behavior of aircraft fuels in pools, physical properties and characteristics of aircraft fuel, and agent application rates and densities.

(B) Requisite Skills. Operate fire streams and apply agent.

5.3.3* Extinguish an aircraft fuel spill fire, given an assignment, PPE, an ARFF vehicle turret flowing a minimum of 946 L/min (250 gpm), a fire sized to the flow rate used [AFFF flow rate divided by 4.92 L/min/m^2 for fire size in square meters (0.13 gpm/ft^2 for fire size in square feet)], and the procedures for agent application, so that the agent is applied according to procedures and the fire is extinguished in a time proportionate to, but no longer than, 90 seconds for 192 m^2 (1923 ft^2) fire with a flow rate at 946 L/min (250 gpm).

(A) Requisite Knowledge. Operation of ARFF vehicle agent delivery systems, the fire behavior of aircraft fuels in pools, physical properties and characteristics of aircraft fuel, the procedures for agent application, and agent application rates and densities.

(B) Requisite Skills. Apply fire-fighting agents and streams using ARFF vehicle turrets.

5.3.4* Extinguish a three-dimensional aircraft fuel fire as a member of a team, given a team, PPE, an assignment, ARFF vehicle hand line(s) using primary and secondary agents, and agent application procedures, so that a dual-agent attack is used, the agent is applied according to procedures, the fire is extinguished, and the fuel source is secured.

(A) Requisite Knowledge. The fire behavior of aircraft fuels in three-dimensional and atomized states, physical properties and characteristics of aircraft fuel, agent application rates and densities, agent application procedures, and methods of controlling fuel sources.

(B) Requisite Skills. Operate fire streams and apply agents, and secure fuel sources.

5.3.5* Attack a fire on the interior of an aircraft while operating as a member of a team, given a team, PPE, an assignment, an ARFF vehicle hand line, an extinguishing agent, and a ladder or other means of accessing the aircraft, so that team integrity is maintained, the attack line is deployed for advancement, ladders or other means are used, access is gained into the fire area, effective agent application practices are used, the fire is approached, attack techniques facilitate suppression given the level of the fire, hidden fires are located and controlled, hazards are avoided or managed, and the fire is brought under control.

(A) Requisite Knowledge. Techniques for accessing the aircraft interior according to the aircraft type, methods for advancing hand lines from an ARFF vehicle, precautions to be followed when advancing hose lines to a fire, observable results that a fire stream has been applied, dangerous structural conditions created by fire, principles of exposure protection, potential long-term consequences of exposure to products of combustion, physical states of matter in which fuels are found, common types of accidents or injuries and their causes, the role of the backup team in fire attack situations, attack and control techniques, and techniques for exposing hidden fires.

(B) Requisite Skills. Deploy ARFF hand line on an interior aircraft fire; gain access to aircraft interior; open, close, and adjust nozzle flow and patterns; apply agent using direct, indirect, and combination attacks; advance charged and uncharged hose lines up ladders and up and down interior and exterior stairways; and locate and suppress interior fires.

5.3.6 Attack an engine or auxiliary power unit/emergency power unit (APU/EPU) fire on an aircraft while operating as a member of a team, given PPE, an assignment, ARFF vehicle hand line or turret, a correct agent, and agent application procedures, so that agent application procedures are followed, the fire is extinguished, and the engine or APU/EPU is shut down.

(A) Requisite Knowledge. Techniques for accessing the aircraft engines and APU/EPUs, safety procedures, methods for advancing hand line from an ARFF vehicle, methods for operating turrets, and methods for shutting down engine and APU/EPU operation.

(B) Requisite Skills. Deploy and operate ARFF hand line, operate turrets, gain access to aircraft engine and APU/EPU, and shut down engine and APU.

5.3.7 Attack a wheel assembly fire, as a member of a team, given PPE, a team, an assignment, an ARFF vehicle hand line, and correct agent, so that the fire is extinguished.

(A) Requisite Knowledge. Agent selection and application procedure, special safety considerations, and the characteristics of combustible metals.

(B) Requisite Skills. Approach the fire in accordance with safety procedures, and select and apply agent.

5.3.8* Ventilate an aircraft through available doors and hatches while operating as a member of a team, given PPE, an assignment, tools, and mechanical ventilation devices, so that openings are created, all ventilation barriers are removed, and the heat and other products of combustion are released.

(A) Requisite Knowledge. Aircraft access points; principles, advantages, limitations, and effects of mechanical ventilation; the methods of heat transfer; the principles of thermal layering within an aircraft on fire; and the techniques and safety precautions for venting aircraft.

(B) Requisite Skills. Operate doors, hatches, and forcible entry tools; operate mechanical ventilation devices; and remove barriers.

5.3.9* Replenish extinguishing agents while operating as a member of a team, given an assignment, an ARFF vehicle, a fixed or mobile water source, a supply of agent, and supply lines and fittings, so that agents are available for application by the ARFF vehicle within the time established by the authority having jurisdiction (AHJ).

(A) Requisite Knowledge. Resupply procedures, operation procedures for ARFF vehicle replenishment, and pumps and transfer devices.

(B) Requisite Skills. Connect hose lines, operate valves, and operate pumps and transfer devices.

5.3.10 Preserve the aircraft accident scene, given an assignment and procedures, so that evidence is identified, protected, and reported according to procedures.

(A) Requisite Knowledge. Airport emergency plan requirements for preservation of the scene, evidence identification, evidence protection, and evidence reporting procedures.

(B) Requisite Skills. Preserve the scene for investigators, and identify, protect, and report evidence.

5.3.11 Overhaul the accident scene, given PPE, an assignment, hand lines, and property conservation equipment, so that all fires are located, exposed, and extinguished and all property is protected from further damage.

(A) Requisite Knowledge. Methods of complete extinguishment and prevention of re-ignition, reasons for conservation, operating procedures for property conservation equipment, overhaul procedures, signs of a hidden fire, methods of detecting hidden fires, and tools and equipment used for overhaul.

(B) Requisite Skills. Use property conservation equipment, detect hidden fires, and use tools and equipment to expose hidden fires.

5.4* Rescue. This duty involves gaining access to an aircraft and assisting in the evacuation process, performing disentanglement, and initial triage.

5.4.1* Gain access into and out of an aircraft through normal entry points and emergency hatches, shut down and safety the aircraft, and assist in the evacuation process while operating as a member of a team, given PPE and an assignment, so that passenger evacuation and rescue can be accomplished.

(A) Requisite Knowledge. Aircraft familiarization, including materials used in construction, aircraft terminology, automatic explosive devices, hazardous areas in and around aircraft, aircraft egress/ingress (hatches, doors, and evacuation chutes), military aircraft systems and associated hazards; capabilities and limitations of manual and power rescue tools and specialized high-reach devices, aircraft shutdown and safetying procedures.

(B) Requisite Skills. Operate power saws and cutting tools, hydraulic devices, pneumatic devices, and pulling devices; operate specialized ladders and high-reach devices; secure aircraft safety and shutdown.

5.4.2* Locate and disentangle an entrapped victim from an aircraft as a member of a team, given PPE, a team and an assignment, and rescue tools, so that the victim is freed from entrapment without undue further injury and hazards are managed.

(A) Requisite Knowledge. Capabilities and limitations of rescue tools, search procedures, hazard identification, and control methods.

(B) Requisite Skills. Perform search procedures, control hazards, remove victims, and operate rescue tools.

5.4.3 Implement initial triage of the victims of an aircraft accident, given PPE, an assignment, and the triage protocol of the AHJ, so that each victim is evaluated and correctly categorized according to protocol.

(A) Requisite Knowledge. Categories of triage according to the triage protocol of the AHJ, and methods of assessment.

(B) Requisite Skills. Triage patients per protocol.

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.3.1 Definitions of action verbs used in the job performance requirements in this document are based on the first definition of the word found in *Merriam-Webster's Collegiate Dictionary*, 11th edition.

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.3.3.7 Hazardous Area. The hazardous area can be adjusted by the incident commander, based on site conditions and risk analysis.

A.3.3.9 National Defense Area. Establishment of a national defense area temporarily places such nonfederal lands under the effective control of the Department of Defense and results only from an emergency event. The senior DOD representative at the scene will define the boundary, mark it with a physical barrier, and post warning signs. The landlord's consent and cooperation will be obtained whenever possible; however, military necessity will dictate the final decision regarding location, shape, and size of the national defense area.

A.3.3.10 Personal Protective Equipment. For fire fighters, approved personal protective equipment should meet the most recent edition of NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, with self-contained breathing apparatus (SCBA) meeting NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, and personal alert safety systems (PASS) meeting NFPA 1982, *Standard on Personal Alert Safety Systems (PASS)*.

A.3.3.15 Theoretical Critical Fire Area (TCA). The TCA is the theoretical area adjacent to an aircraft in which fire must be

controlled for the purpose of ensuring temporary fuselage integrity and providing an escape area for its occupants.

The "Report of the Second Meeting of the ICAO Rescue and Fire Fighting Panel" (RFFP-II) was prepared with the benefit of large test fire experiments conducted by a member country aimed at estimating the size of the TCA (Geyer 1972). Geyer's study paid particular attention to the width on each side of the fuselage that would have to be secured to protect the aircraft's skin from melting under severe fire conditions. On the basis of the data presented in the resulting report, the RFFP agreed that the TCA should be a rectangle having as one dimension the overall length of the aircraft and the other dimension determined by the following:

(1) For aircraft with an overall length of less than 20 m (65 ft), 12 m (40 ft) plus the width of the fuselage
(2) For aircraft with an overall length of 20 m (65 ft) or more, 30 m (100 ft) plus the width of the fuselage

The theoretical critical area serves only as a means for categorizing aircraft in terms of the magnitude of the potential fire hazard in which they may become involved. It is not intended to represent the average, maximum, or minimum spill fire size associated with a particular aircraft. The original formula for the maximum theoretical critical area, as presented in the RFFP-II report, was given as follows :

$$A_T = L \times (30 + w) \text{ where } L \geq 20 \text{ m}$$

$$\left[A_T = L \times (100 + w) \text{ where } L \geq 65 \text{ ft}\right]$$

$$A_T = L \times (12 + w) \text{ where } L < 20 \text{ m}$$

$$\left[A_T = L \times (40 + w) \text{ where } L < 65 \text{ ft}\right]$$

where:
L = overall length of the aircraft
w = width of the aircraft fuselage
A_T = theoretical critical area (TCA)

The data analyzed by RFFP-II in its effort to respond to the issue of TCA versus practical critical area (PCA) appeared to indicate that the PCA was approximately two-thirds of the TCA. This had been verified by a study conducted by one of the member countries of actual spill fire sizes and aircraft accidents (Ansart 1970). Another analysis of aircraft rescue and fire-fighting operations had not included the study of the PCA as compared to the TCA . However, that study did compare the actual amount of water used for foam at those accidents with the amounts recommended by RFFP-I. It was found that in 93 percent of accidents for which this information was available (99 cases out of 106), the amounts recommended by the Panel were in excess of those required in the actual aircraft accident. In light of this, the Panel decided to use two-thirds of the TCA as the PCA . (See Figure A.3.3.15 for a graphic display of this concept.) The formula for the PCA developed by RFFP-II for fixed-wing aircraft can be expressed as follows:

$$PCA = (0.67) \times (TCA)$$

A.3.3.16.1 Cold Zone. The purpose of the cold zone is to ensure that there is an easily recognized boundary for arriving fire fighters and support personnel so that they do not impinge on the hazardous area, where SCBA and PPE are required. The secondary purpose of the cold zone is a distance sufficient for an initial hand line to reach the entrance of the aircraft interior.

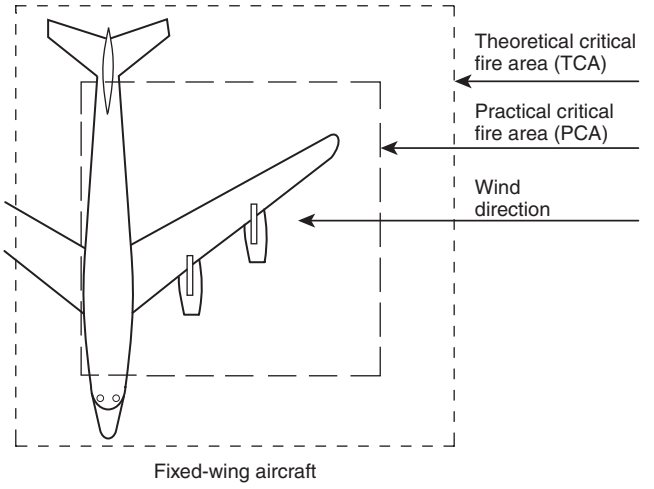

FIGURE A.3.3.15 Theoretical Critical Fire Area (TCA) Relative to Practical Critical Fire Area (PCA). [403, 2009]

A.3.3.16.2 Hot Zone. This zone is also referred to as the *exclusion zone* or the *restricted zone* in other documents.

A.3.3.16.3 Warm Zone. The warm zone includes control points for the decontamination corridor, thus helping to reduce the spread of contamination. This zone is also referred to as the *decontamination zone* or *limited access zone* in other documents.

A.4.1 Due to improvements in the design and construction of modern aircraft and the increased structural integrity that results, the potential exists for significant interior fires that cannot be extinguished using external aircraft fire-fighting tactics. Because extinguishing aircraft interior fires is an essential task of the airport fire fighter, the Fire Fighter II requirement in this document is primary. The basic fire-fighting skills and knowledge required for Fire Fighter II in NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, are essential to the airport fire fighter.

A.4.4.1 Continuing education or training is necessary to ensure that fire fighters remain current and update their knowledge and skills in the evolving field of ARFF by attending workshops and seminars, undergoing competency testing, participating in recurring proficiency evolutions, and/or accessing professional publications as determined by the AHJ. Nationally recognized certification is one means of demonstrating proficiency in current practices.

A.5.1.1.3 Airport fire fighters should possess knowledge of military aircraft at those airports that accept military aircraft or at those airports that are co-located with a military installation with either separate or shared runways. This knowledge should include the following:

(1) Military cargo/passenger aircraft
(2) Military tanker aircraft
(3) Military fighter/attack aircraft
(4) Military helicopter aircraft

(5) USAF Technical Order 00-105E-9, *Aerospace Emergency Rescue and Mishap Response Information (Emergency Services),* contains specific information concerning aircraft rescue and fire fighting procedures and should be consulted prior to any attempt to perform rescue operations if trained military specialists are not available for immediate assistance. USN/USMC aircraft information is located in NAVAIR 00-80R-14 and 00-80R-14-1. These documents contain specific information concerning fire fighting and rescue operations for aircraft in the military inventory. They specifically address the following:
   (a) Entry. If the emergency controls are activated, an explosive charge will explosively separate the canopy from the aircraft.
   (b) Ejection Systems. All fighter, bomber, and attack aircraft are equipped with ejection seats. Once access has been gained to the cockpit, caution is extremely important, because these ejection seats, when activated, are propelled out of the aircraft by an explosive charge. Airport fire fighters should not touch or activate any controls. Note that if a canopy or hatch has been separated from an aircraft, the ejection seat is automatically armed. Extreme caution must be exercised in crew removal.
   (c) Extrication. The aircrew member is secured to the seat by a series of straps, harnesses, and restraint belts. These restraints can be released by cutting if the release procedure is unknown.
   (d) Ordnance. Fighter and attack aircraft will have forward firing ordnance located in the forward part of the fuselage or wings.
   (e) Engine Shutdown. Engine shutdown usually can be accomplished by pulling T-handles, as on a commercial jet.

The *NFPA Aircraft Familiarization Charts Manual*, which contains complete diagrams of 115 types of aircraft, detailing their physical characteristics, is also helpful.

A.5.2.4 Hazardous conditions include special fuels, fueling operations (grounding and bonding), welding operations, hazardous materials operations, corrosion control, fuel cell maintenance, and military operations.

A.5.3.1 Concerns with the environmental impact of traditional flammable liquid training fires have caused many facilities to convert to propane-fueled simulators. The intent of this requirement is a safe and proper extinguishment technique for pool fires involving aircraft fuels. The use of pressurized flammable gas or flammable liquid is acceptable for this simulation.

A.5.3.2 The use of pressurized flammable gas or flammable liquid is acceptable for this simulation. Depending on the square footage of the local training simulators and the flow rate of the assigned application device, the specified time of extinguishment might need to be modified. When using simulators with lower square footage or different flow rates of agent application, the specified time of extinguishment will need to be proportional.

For example, a hand line flowing 359 L/min (95 gpm) would be required to extinguish a fire of 750 ft^2 in 90 seconds. The formula is 95 gpm/0.13 = 730 fire square footage for 69.7 m^2 (750 ft^2) fire with a flow rate at 359 L/min (95 gpm).

A.5.3.3 See A.5.3.2. For example, a candidate using a turret flowing 946 L/min (250 gpm) is required to extinguish a fire of 2067 ft^2 in 90 seconds for 192 m^2 (2067 ft^2) fire with a flow rate at 946 L/min (250 gpm).

A.5.3.4 Three-dimensional or running fuel fires involve a fuel leak from an elevated or pressurized source. The fuel burns as it falls through the air, and, once on the ground, the burning fuel can pool or run across the ground surface. These fuel fires are extremely difficult to extinguish. They must be recognized and action must be taken to extinguish them early in the incident or accident for successful fire-fighting operations. Typically, these fires cannot be extinguished by smothering agents such as AFFF, because those agents cannot seal the surface and exclude oxygen. Such fires are more successfully extinguished by shutting off the fuel flow or by using agents, such as dry chemicals, that interfere with the chemical or chain reaction.

A.5.3.5 This requirement can be met by using a structural burn facility that is configured to simulate the interior layout and dimensions of an aircraft fuselage and that contains mannequins to simulate victims. The mock-up should include at least three metal seats and training dummies to simulate victims. It is intended that the size of the aircraft be the largest type that normally uses the airport and that the hand line be appropriate to the size of the aircraft.

A.5.3.8 Training and evaluation of this task can be accomplished using actual aircraft or mock-ups and smoke-generation devices used for training.

A.5.3.9 The replenishment task is time critical. Evaluating the proficiency of potential ARFF personnel to replenish the extinguishing agents on an ARFF vehicle requires that the AHJ evaluate several factors related to its own airport emergency plan in order to establish a fair benchmark for personnel. The following factors influence this time constraint:

(1) Size of the ARFF vehicles' agent reservoirs
(2) Available replenishment methods and their agent flow capacities
(3) Proximity of replenishment means to the potential ARFF emergency locations in and around the airport

In making these evaluations, the AHJ must keep in mind that its overall objective is to ensure an adequate agent flow at the scene during an emergency. The following is an example of determining the replenishment time variable:

If the typical ARFF vehicle on the airport runway holds 5677 L (1500 gal) of water and 568 L (150 gal) of AFFF, the replenishment means is a fixed water hydrant located at the midway point of the runways. If a hydrant flow capacity is 946 L/min (250 gpm) and if the average time to drive from the approach and departure end of any runway to the midpoint is 2 minutes, then a reasonable time to replenish a vehicle and return it to operation from the end of the runway is 18 minutes. This allows 2 minutes to drive to the hydrant, 4 minutes to connect to the hydrant, 7 minutes to fill the water tank, 3 minutes to disconnect from the hydrant, and 2 minutes to drive back to the end of the runway.

This might be considered a reasonable amount of time to replenish the vehicle at this particular airport, if additional vehicles are available to continue support at the emergency scene, but it might be entirely too slow for an airport where this ARFF vehicle is the only vehicle available to support an aircraft scene. In this case, the replenishment plan should be reevaluated and adjusted to reduce the time required.

A.5.4 One of the primary tasks of rescue operations is for the airport fire fighter to maintain a habitable environment

around the fuselage and to assist with aircraft evacuation by stabilizing slide chutes and assisting and controlling the evacuees.

A.5.4.1 Training and evaluation of this task can be accomplished using actual aircraft or mock-ups.

A.5.4.2 Training and evaluation of this task can be accomplished using actual aircraft or mock-ups.

Annex B Using Job Performance Requirements

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

B.1 Explanation of the Standards and Concepts of Job Performance Requirements (JPRs). The primary benefit of establishing national professional qualification standards is to provide the public and private sectors with a framework of the job requirements for the fire service. Other benefits include enhancement of the profession, individual as well as organizational growth and development, and standardization of practices.

NFPA professional qualification standards identify the minimum JPRs for specific fire service positions. The standards can be used for implementing training design and evaluation; certifying, measuring, and critiquing on-the-job performance; defining hiring practices; and setting organizational policies, procedures, and goals. (Other applications are encouraged.)

Professional qualification standards for a specific job are organized by major areas of responsibility defined as duties. For example, the fire fighter's duties might include fire suppression, rescue, and water supply; and the public fire educator's duties might include education, planning and development, and administration. Duties are major functional areas of responsibility within a job.

The professional qualification standards are written as JPRs. JPRs describe the performance required for a specific job. JPRs are grouped according to the duties of a job. The complete list of JPRs for each duty defines what an individual must be able to do in order to successfully perform that duty. Together, the duties and their JPRs define the job parameters; that is, the professional qualification standard as a whole is a job description.

B.2 Breaking Down the Components of a JPR. The JPR is the assembly of three critical components. *(See Table B.2.)* These components are as follows:

(1) Task that is to be performed
(2) Tools, equipment, or materials that must be provided to successfully complete the task
(3) Evaluation parameters and/or performance outcomes

B.2.1 The Task to Be Performed. The first component is a concise statement of what the person is supposed to do.

B.2.2 Tools, Equipment, or Materials That Must Be Provided to Successfully Complete the Task. This component ensures that all individuals completing the task are given the same minimal tools, equipment, or materials when being evaluated. By listing these items, the performer and evaluator know what must be provided in order to complete the task.

B.2.3 Evaluation Parameters and/or Performance Outcomes. This component defines how well one must perform each task — for both the performer and evaluator. The JPR guides performance outcomes. This portion of the JPR promotes consistency in evaluation by reducing the variables used to gauge performance.

Table B.2 Example of a JPR

(1) Task	(1) Ventilate a pitched roof
(2) Tools, equipment, or materials	(2) Given an ax, a pike pole, an extension ladder, and a roof ladder
(3) Evaluation parameters and performance outcomes	(3) So that a 1.22 m × 1.22 m (4 ft × 4 ft) hole is created; all ventilation barriers are removed; ladders are properly positioned for ventilation; ventilation holes are correctly placed; and smoke, heat, and combustion by-products are released from the structure

In addition to these three components, the JPR contains requisite knowledge and skills. Just as the term *requisite* suggests, they are the necessary knowledge and skills one must have prior to being able to perform the task. Requisite knowledge and skills are the foundation for task performance.

Once the components and requisites are put together, the JPR might read as follows.

B.2.3.1 Example 1. The Fire Fighter I shall ventilate a pitched roof, given an ax, a pike pole, an extension ladder, and a roof ladder, so that a 1.22 m × 1.22 m (4 ft × 4 ft) hole is created, all ventilation barriers are removed, ladders are properly positioned for ventilation, and ventilation holes are correctly placed.

(A) Requisite Knowledge. Pitched roof construction, safety considerations with roof ventilation, dangers associated with incorrect ventilation, knowledge of ventilation tools, effects of ventilation on fire growth, smoke movement in structures, signs of backdraft, and knowledge of vertical and forced ventilation.

(B) Requisite Skills. Remove roof covering; correctly initiate roof cuts; use the pike pole to clear ventilation barriers; use ax correctly for sounding, cutting, and stripping; position ladders; and climb and position self on ladder.

B.2.3.2 Example 2. The fire investigator shall interpret burn patterns, given standard equipment and tools and some structural/content remains, so that each individual pattern is evaluated with respect to the burning characteristics of the material involved.

(A) Requisite Knowledge. Fire development and the interrelationship of heat release rate, form, and ignitibility of materials.

(B) Requisite Skill. Interpret the effects of burning characteristics on different types of materials.

B.3 Examples of Potential Uses.

B.3.1 Certification. JPRs can be used to establish the evaluation criteria for certification at a specific job level. When used for certification, evaluation must be based on the successful completion of JPRs.

First, the evaluator would verify the attainment of requisite knowledge and skills prior to JPRs evaluation. Verification might be through documentation review or testing.

Next, the candidate would be evaluated on completing the JPRs. The candidate would perform the task and be evaluated based on the evaluation parameters, the performance outcomes, or both. This performance-based evaluation can be either practical (for psychomotor skills such as "ventilate a roof") or written (for cognitive skills such as "interpret burn patterns").

Note that psychomotor skills are those physical skills that can be demonstrated or observed. Cognitive skills (or mental skills) cannot be observed but are evaluated on how one completes the task (process oriented) or on the task outcome (product oriented).

Using Example 1 in B.2.3.1, a practical performance-based evaluation would measure the ability to "ventilate a pitched roof." The candidate passes this particular evaluation if the standard was met, that is, if a 1.22 m × 1.22 m (4 ft × 4 ft) hole was created; all ventilation barriers were removed; ladders were correctly positioned for ventilation; ventilation holes were correctly placed; and smoke, heat, and combustion byproducts were released from the structure.

For Example 2 in B.2.3.2, when evaluating the task "interpret burn patterns," the candidate might be given a written assessment in the form of a scenario, photographs, and drawings and then be asked to respond to specific written questions related to the JPR's evaluation parameters.

It is important to remember that when a candidate is being evaluated, he or she must be given the tools, equipment, or materials listed in the JPRs before he or she can be correctly evaluated: for example, an ax, a pike pole, an extension ladder, and a roof ladder.

B.4 Curriculum Development/Training Design and Evaluation. The statements contained in this document that refer to job performance were designed and written as JPRs. Although a resemblance to instructional objectives might be present, these statements should not be used in a teaching situation until after they have been modified for instructional use.

JPRs state the behaviors required to perform a specific skill(s) on the job, as opposed to a learning situation. These statements should be converted into instructional objectives with behaviors, conditions, and standards that can be measured within the teaching/learning environment. A JPR that requires a fire fighter to "ventilate a pitched roof" should be converted into a measurable instructional objective for use when teaching the skill. *[See Figure B.4(a).]*

Using Example 1 in B.2.3.1, a terminal instructional objective might read as follows:

The candidate will ventilate a pitched roof, given a simulated roof, an ax, a pike pole, an extension ladder, and a roof ladder, so that 100 percent accuracy is attained on a skills checklist. (At a minimum, the skills checklist should include each of the measurement criteria from the JPR.)

Although the differences between job performance requirements and instructional objectives are subtle in appearance, the purpose of each statement differs greatly. JPRs state what is necessary to perform the job in the "real world." Instructional objectives, however, are used to identify what students must do at the end of a training session and are stated in behavioral terms that are measurable in the training environment.

By converting JPRs into instructional objectives, instructors will be able to clarify performance expectations and avoid confusion related to using statements designed for purposes other than teaching. Additionally, instructors will be able to add local/state/regional elements of performance into the standards as intended by the developers.

Requisite skills and knowledge should be converted into enabling objectives. These objectives help to define the course content. The course content should include each of the requisite knowledge and skills. Using Figure B.4(b), the enabling objectives are pitched roof construction, safety considerations with roof ventilation, removal of roof covering, proper roof cuts, and so on. These objectives ensure that the course content supports the terminal objective.

Note that it is assumed that the reader is familiar with curriculum development or training design and evaluation.

B.5 Other Uses. While the professional qualifications standards are used principally to guide the development of training and certification programs, there are a number of other potential uses for these documents. Because they are written in JPR terms, they lend themselves well to any area of the profession where a level of performance or expertise must be determined. Such areas might include the following:

(1) Employee evaluation/performance critiquing: JPRs can be used as a guide by both the supervisor and the employee during an evaluation. The JPRs for a specific job define tasks that are essential to perform on the job, as well as the evaluation criteria to measure when those tasks are completed.
(2) Establishing hiring criteria: Professional qualifications standards can be used in a number of ways to further the establishment of hiring criteria. The authority having jurisdiction could simply require certification at a specific job level, for example, Fire Fighter I. The JPRs could also be used as the basis for pre-employment screening by establishing essential minimal tasks and the related evaluation criteria. An added benefit is that individuals interested in employment can work toward the minimal hiring criteria at local colleges.
(3) Employee development: The professional qualifications standards can be useful to both the employee and the employer in developing a plan for the individual's growth within the organization. The JPRs and the associated requisite skills and knowledge can be used as a guide to determine additional training and education required for the employee to master the job or profession.
(4) Succession planning: Succession planning, or career pathing, addresses the efficient placement of people into jobs in response to current needs and anticipated future needs. A career development path can be established for targeted individuals to prepare them for growth within the organization. The JPRs and requisite knowledge and skills could then be used to develop an educational path to aid in the individual's advancement within the organization or profession.
(5) Establishing organizational policies, procedures, and goals: The JPRs can be incorporated into organizational policies, procedures, and goals where employee performance is addressed.

B.6 Bibliography. See Section C.2 for a bibliography for Annex B.

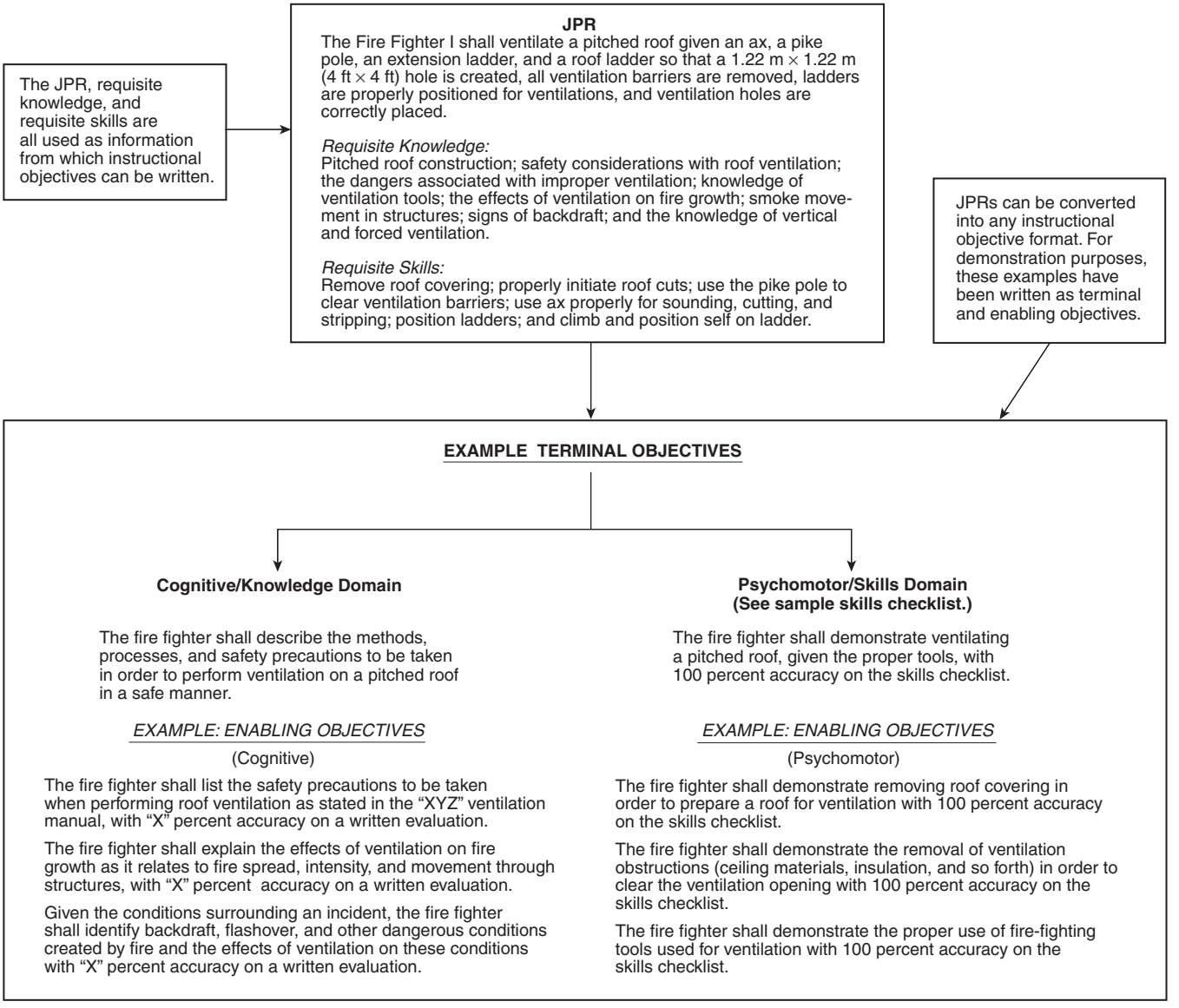

FIGURE B.4(a) Converting JPRs into Instructional Objectives.

Annex C Informational References

C.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.

C.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, 2008 edition.

NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, 2007 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, 2007 edition.

NFPA 1982, *Standard on Personal Alert Safety Systems (PASS)*, 2007 edition.

NFPA *Aircraft Familiarization Charts Manual*, 1999.

C.1.2 Other Publications.

Ansart, F., Analysis of Reports of Accidents No. 1 to 217 Filed with ICAO as of March 1970, Unpublished meeting records of reference material used by RFFP-II.

Geyer, G. B., "Evaluation of Aircraft Ground Fire Fighting Agents and Techniques," Report No. AGFSRS-71-1, Tri-Service Systems Program Office Aircraft Ground Fire Suppression and Rescue, Wright-Patterson AFB, OH 45433, February 1972. NTIS No. AD 741 881, Section VIII, p. 172ff.

NAVAIR 00-80R-14 and 00-80R-14-1, available at https://www.natec.navy.mil/ (registration required).

OBJECTIVE: The fire fighter shall demonstrate ventilating a pitched roof, given the proper tools, within 5 minutes and with 100 percent accuracy on the skills checklist.

YES	NO	
❑	❑	1. 1.22 m × 1.22 m (4 ft × 4 ft) hole was created.
❑	❑	2. All ventilation barriers were removed.
❑	❑	3. Ladders were properly positioned.
❑	❑	4. Ventilation holes were correctly placed (directly over fire, at highest point, and so forth)
❑	❑	5. The task completed within 5 minutes. (Time to complete task: _____.)

FIGURE B.4(b) Sample Skills Checklist (roof ventilation).

USAF Technical Order 00-105E-9, *Aerospace Emergency Rescue and Mishap Response Information (Emergency Services)*, HQ AFCESA/CEXF, 139 Barnes Drive, Suite 1, Tyndall AFB, FL 32403-5319, phone: 1-888-AFCE-SA-1.

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

C.2 Informational References. The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

Boyatzis, R. E. (1982). *The Competent Manager: A Model for Effective Performance*. New York: John Wiley & Sons.

Castle, D. K. (1989). "Management Design: A Competency Approach to Create Exemplar Performers." *Performance and Instruction*, 28, pp. 42–48.

Cetron, M., and O'Toole, T. (1983). *Encounters with the Future: A Forecast into the 21st Century*. New York: McGraw Hill.

Elkin, G. (1990). "Competency-Based Human Resource Development: Making Sense of the Ideas." *Industrial and Commercial Training*, 22, pp. 20–25.

Furnham, A. (1990). "The Question of Competency." Personnel Management, 22, p. 37.

Gilley, J. W., and Eggland, S. A. (1989). *Principles of Human Resource Development*. Reading, MA: Addison-Wesley.

Harley, R. A., Chairman, "Report of the Second Meeting of the ICAO Rescue and Fire Fighting Panel (RFFP-II)," June 5–16, 1972, Montreal, Canada.

Hooton, J. (1990). *Job Performance = Tasks + Competency × Future Forces*. Unpublished manuscript, Vanderbilt University, Peabody College, Nashville, TN.

McLagan, P. A. (1989). "Models for HRD Practice." *Training and Development Journal*, reprinted.

McLagan, P. A. and Suhadolnik, D. (1989). *The Research Report*. Alexandria, VA: American Society for Training and Development.

Nadler, L. (1983). "HRD on the Spaceship Earth." *Training and Development Journal*,October, pp. 19–22.

Nadler, L. (1984). *The Handbook of Human Resource Development*. New York: Wiley-Interscience.

Naisbitt, J. (speaker) (1984). *Megatrends* (cassette recording No. 210). Chicago: Nightingale-Conant.

Spellman, B. P. (1987). "Future Competencies of the Educational Public Relations Specialist" (doctoral dissertation, University of Houston, 1987). *Dissertation Abstracts International*, 49, 02A.

Springer, J. (1980). *Job Performance Standards and Measures*. A series of research presentations and discussions for the ASTD Second Annual Invitational Research Seminar, Savannah, GA (November 5–8, 1979). Madison, WI: American Society for Training and Development.

Tracey, W. R. (1984). *Designing Training and Development Systems*. New York: AMACOM.

C.3 References for Extracts in Informational Sections.

NFPA 403, *Standard for Aircraft Rescue and Fire-Fighting Services at Airports*, 2009 edition.