NFPA® 1583

Standard on Health-Related Fitness Programs for Fire Department Members

2008 Edition

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

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NFPA® 1583

Standard on

Health-Related Fitness Programs for Fire Department Members

2008 Edition

This edition of NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Department Members*, was prepared by the Technical Committee on Fire Service Occupational Safety and Health. It was issued by the Standards Council on June 4, 2007, with an effective date of June 24, 2007, and supersedes all previous editions.

This edition of NFPA 1583 was approved as an American National Standard on June 24, 2007.

Origin and Development of NFPA 1583

The initial edition of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program,* contained language requiring that the fire department develop a physical fitness program for its members. In the early 1990s, the technical committee responsible for NFPA 1500 began the development of a specific document to support that requirement. A recommended practice was prepared by the committee and processed through the standards system but never issued.

In June 1997, a new Technical Committee on Fire Service Occupational Medical and Health revived the project, but with a new focus. That focus was to provide a fire fighter with a comprehensive document focused on maintaining a healthy lifestyle, with a fitness component. The first edition was issued in 2000 as NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Fighters*.

The multiple stress factors and rigors of their profession require fire fighters to be medically and physically fit in order to perform required tasks. The committee considers this standard to be a companion document to NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*, and a tool to be used in conjunction with the *Joint Labor Management Wellness-Fitness Initiative,* developed by the International Association of Fire Fighters (IAFF) and the International Association of Fire Chiefs (IAFC).

This edition of the document has been updated to reflect current practices in health-related fitness programs for fire department members and to editorially conform to the *Manual of Style for NFPA Technical Committee Documents*. The title is being changed to *Standard on Health-Related Fitness Programs for Fire Department Members*.

The revisions introduce the concept that, while a health and fitness program should require mandatory participation, it should be nonpunitive. The section on peer fitness trainers has been expanded to include requirements for their qualifications and responsibilities. The relationship between the health and fitness coordinator (HFC) and the fire department physician is clarified.

A requirement has been added that the health and fitness coordinator design an individualized exercise and fitness training program for a member returning to full duty from a debilitating injury, illness, or any other extended leave.

Annex materials are reorganized to focus on the fire department providing an adequate facility rather than a prescriptive list of equipment. Included are a suggestion that the HFC have a background in functional anatomy, exercise physiology, exercise testing and prescription, exercise supervision, and leadership rather than a long list of qualifications, and a self-assessment tool for use by members to monitor their individual fitness levels.

Technical Committee on Fire Service Occupational Safety and Health

Glenn P. Benarick, *Chair*
Aiken, SC [U]
Rep. NFPA Fire Service Section

Murrey E. Loflin, *Secretary*
West Virginia University, WV [U]
(Alt. to G. P. Benarick)

Donald Aldridge, Lion Apparel, Inc., OH [M]
David J. Barillo, University of Florida College of Medicine, FL [SE]
Paul "Shon" Blake, City of Baytown Fire & Rescue Services, TX [E]
Rep. Industrial Emergency Response Working Group
Sandy Bogucki, Yale University Emergency Medicine, CT [SE]
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Dominic J. Colletti, Hale Products, Inc., PA [M]
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Phil Eckhardt, Mine Safety Appliances Company, PA [M]
Rep. International Safety Equipment Association
Jodi A. Gabelmann, Cobb County Fire and Emergency Services, GA [L]
Rep. Women in the Fire Service, Inc.
Tom Hillenbrand, Underwriters Laboratories Inc., IL [RT]
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Steve L. Kreis, City of Phoenix Fire Department, AZ [E]
Tamara DiAnda Lopes, Reno Fire Department, NV [U]
David A. Love, Jr., Volunteer Firemen's Insurance Services, Inc., PA [I]
George L. Maier III, Fire Department City of New York, NY [U]
Denis M. Murphy, Nassau County Fire Service Academy, NY [U]
Rep. Association of Fire Districts/State of New York
Stephen E. Norris, United Firefighters of Los Angeles City, CA [L]
David J. Prezant, Fire Department City of New York, NY [E]
Joseph W. Rivera, U.S. Air Force, FL [U]
David Ross, Toronto Fire Services, Canada [E]
Rep. Fire Department Safety Officers Association
Mario D. Rueda, Los Angeles City Fire Department, CA [U]
Daniel G. Samo, Evanston Northwestern Healthcare—OMEGA, IL [SE]
Donald F. Stewart, Medocracy Inc./Fairfax County Fire & Rescue, VA [E]
Philip C. Stittleburg, LaFarge Fire Department, WI [U]
Rep. National Volunteer Fire Council
Teresa Wann, Santa Ana College, CA [SE]
Don N. Whittaker, U.S. Department of Energy, ID [E]
Hugh E. Wood, U.S. Department of Homeland Security, MD [SE]
Kim D. Zagaris, State of California, CA [E]

Alternates

Janice C. Bradley, International Safety Equipment Association, VA [M]
(Alt. to P. Eckhardt)
Michael L. Finkelman, East Meadow, NY [U]
(Alt. to D. M. Murphy)
Craig A. Fry, Los Angeles City Fire Department, CA [U]
(Alt. to M. D. Rueda)
Al H. Gillespie, North Las Vegas Fire Department, NV [E]
(Alt. to I. D. Daniels)
John Granby, Lion Apparel, Inc., OH [M]
(Alt. to D. Aldridge)
Allen S. Hay, Fire Department City of New York, NY [U]
(Alt. to G. L. Maier III)
Thomas Healy, Daisy Mountain Fire District, AZ [E]
(Alt. to S. L. Kreis)
James Johannessen, Underwriters Laboratories Inc., PA [RT]
(Alt. to T. Hillenbrand)
Sandra S. Kirkwood, Las Vegas Fire/Rescue Department, NV [SE]
(Alt. to T. Wann)
Robert L. McLeod III, City of Chandler Fire Department, AZ [E]
(Alt. to D. Ross)
Robert P. Murgallis, U.S. Department of Homeland Security, MD [SE]
(Alt. to H. E. Wood)
Gary L. Neilson, Reno Fire Department, NV [U]
(Alt. to T. DiAnda Lopes)
Michael W. Smith, Nevada Division of Forestry, NV [U]
(Alt. to P. C. Stittleburg)
Fred C. Terryn, U.S. Air Force, FL [U]
(Alt. to J. W. Rivera)
Michael L. Young, Volunteer Firemen's Insurance Services, Inc., PA [I]
(Alt. to D. A. Love, Jr.)

Nonvoting

Matthew I. Chibbaro, U.S. Department of Labor, DC [E]
Thomas R. Hales, U.S. Department of Health and Human Services, OH [RT]
Andrew Levinson, U.S. Department of Labor, DC [E]
(Alt. to M. I. Chibbaro)
Mark F. McFall, U.S. Department of Health and Human Services, WV [RT]
(Alt. to T. R. Hales)

Carl E. Peterson, NFPA Staff Liaison

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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 occupational safety and health in the working environment of the fire service. The Committee shall also have responsibility for documents related to medical requirements for fire fighters.

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NFPA 1583

Standard on

Health-Related Fitness Programs for Fire Department Members

2008 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.

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 D. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. 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 D.

Chapter 1 Administration

1.1* Scope. This standard establishes the minimum requirements for the development, implementation, and management of a health-related fitness program (HRFP) for members of the fire department involved in emergency operations.

1.2 Purpose.

1.2.1 The purpose of this standard is to provide the minimum requirements for a health-related fitness program for fire department members that enhances the members' ability to perform occupational activities efficiently and safely and reduces the risk of injury, disease, and premature death.

1.2.2* This document is intended to help fire departments develop a health-related fitness program for fire department members that requires mandatory participation but is nonpunitive.

1.2.3 This document is not intended to establish physical performance criteria.

1.3 Application.

1.3.1 The requirements of this standard apply to organizations providing rescue, fire suppression, emergency medical services, hazardous materials mitigation, special operations, and other emergency services, including public, military, private, and industrial fire departments.

1.3.2 This standard does not apply to industrial fire brigades that might also be known as emergency brigades, emergency response teams, fire teams, plant emergency organizations, or mine emergency response teams.

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

NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments,* 2007 edition.

2.3 Other Publications.

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

2.4 References for Extracts in Mandatory Sections.

NFPA 600, *Standard on Industrial Fire Brigades,* 2005 edition.

NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program,* 2007 edition.

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

NFPA 1561, *Standard on Emergency Services Incident Management System,* 2005 edition.

NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments,* 2007 edition.

NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments,* 2004 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 Should. Indicates a recommendation or that which is advised but not required.

3.3 General Definitions.

3.3.1 Debilitating Illness or Injury. A condition that temporarily or permanently prevents a member of the fire department from engaging in normal duties and activities as a result of illness or injury. [**1500**, 2007]

3.3.2 Emergency Operations. Activities of the fire department relating to rescue, fire suppression, emergency medical care, and special operations, including response to the scene of the incident and all functions performed at the scene. [**1500**, 2007]

3.3.3 Fire Chief. The highest ranking officer in charge of a fire department. [**1710,** 2004]

3.3.4* Fire Department. An organization providing rescue, fire suppression, emergency medical care, special operations, and related services.

3.3.5 Fire Department Member. See 3.3.17, Member.

3.3.6 Fire Department Physician. The licensed doctor of medicine or osteopathy who has been designated by the fire department to provide professional expertise in the areas of occupational safety and health as they relate to emergency services. [**1582,** 2007]

3.3.7* Fire Suppression. The activities involved in controlling and extinguishing fires. [**1500**, 2007]

3.3.8* Hazard. A condition that presents the potential for harm or damage to people, property, or the environment.

3.3.9 Health and Fitness Coordinator. The person who, under the supervision of the fire department physician, has been designated by the department to coordinate and be responsible for the health and fitness programs of the department. [**1500**, 2007]

3.3.10* Health and Safety Officer. The member of the fire department assigned and authorized by the fire chief as the manager of the safety and health program. [**1500**, 2007]

3.3.11 Health Promotion. Preventive activities that identify real and potential health risks in the work environment and that inform, motivate, and otherwise help people to adopt and maintain healthy practices and lifestyles.

3.3.12* Health-Related Fitness Program (HRFP). A comprehensive program designed to promote the member's ability to perform occupational activities and to reduce or eliminate injuries and premature death.

3.3.13 Industrial Fire Brigade. An organized group of employees within an industrial occupancy who are knowledgeable, trained, and skilled in at least basic fire fighting operations, and whose full-time occupation might or might not be the provision of fire suppression and related activities for their employer. [**600**, 2005]

3.3.14 Infectious Disease. An illness or disease resulting from invasion of a host by disease-producing organisms such as bacteria, viruses, fungi, or parasites. [**1500**, 2007]

3.3.15 Medical Evaluation. The analysis of information for the purpose of making a determination of medical certification. Medical evaluation includes a medical examination. [**1582**, 2007]

3.3.16 Medical Examination. An examination performed or directed by the fire department physician. [**1582**, 2007]

3.3.17* Member. A person involved in performing the duties and responsibilities of a fire department under the auspices of the organization. [**1500**, 2007]

3.3.18 Member Assistance Program (MAP). A generic term used to describe the various methods used in the fire department for the control of alcohol and other substance abuse, stress, and personal problems that adversely affect member performance. [**1500**, 2007]

3.3.19* Morbidity. The state of being diseased.

3.3.20 Occupational Injury. An injury sustained during the performance of the duties, responsibilities, and functions of a fire department member. [**1500**, 2007]

3.3.21 Procedure. An organizational directive issued by the authority having jurisdiction or by the department that establishes a specific policy that must be followed. [**1561**, 2005]

3.3.22 Punitive. Inflicting or aiming to inflict punishment or sanctions.

3.3.23 Qualified Person. A person who, by possession of a recognized degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, has demonstrated the ability to deal with problems related to the subject matter, the work, or the project. [**1451,** 2007]

3.3.24 Risk. A measure of the probability and severity of adverse effects that result from exposure to a hazard. [**1451**, 2007]

3.3.25* Standard Operating Procedure. A written organizational directive that establishes or prescribes specific operational or administrative methods to be followed routinely for the performance of designated operations or actions.

Chapter 4 Organization

4.1 Program Overview.

4.1.1* The fire department shall establish and provide a health-related fitness program (HRFP) that enables members to develop and maintain a level of health and fitness to safely perform their assigned functions.

4.1.2 The fire chief shall have the ultimate responsibility for the fire department's health-related fitness program as required by NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.*

4.1.3 When this standard is adopted by a jurisdiction, the authority having jurisdiction shall set a date or dates for achieving compliance with the requirements of this standard and shall be permitted to establish a phase-in schedule for compliance with specific requirements of this standard.

4.1.4 Nothing in this standard shall restrict any jurisdiction from exceeding the requirements set forth herein.

4.1.5 The fire department shall incorporate the requirements of this standard in its risk management plan.

4.2 Program Components. The health-related fitness program shall include the following components:

(1) Assignment of a qualified health and fitness coordinator
(2) Periodic fitness assessment for all members
(3) Exercise training program that is available to all members
(4) Education and counseling regarding health promotion for all members
(5) Process for collecting and maintaining health-related fitness program data

4.3 Roles and Responsibilities.

4.3.1 Each member of the fire department shall cooperate with, participate in, and comply with the provisions of the health-related fitness program.

4.3.2 The fire department shall require the structured participation of all members in the health-related fitness program.

4.4 Logistics.

4.4.1 The fire department shall be responsible for providing the opportunity and means for implementation of the health-related fitness program.

4.4.2* The fire department shall provide the opportunity and means for regular exercise training.

4.4.2.1* Fire departments with assigned work shifts shall allow members to participate during scheduled work times.

4.4.2.2 Fire departments without assigned work shifts shall provide members with the opportunity to participate at times that do not conflict with other commitments.

4.5 Program Referrals.

4.5.1 The fire department shall be responsible for providing educational resources and professional referrals as needed.

4.5.2 The fire department shall be financially responsible for fees associated with referrals only to the extent departmental policy, procedures, standard guidelines, or statutory obligations dictate.

Chapter 5 Health and Fitness Coordinator and Peer Fitness Trainers

5.1 Assignment.

5.1.1 The fire chief shall appoint a health and fitness coordinator (HFC).

5.1.2* The health and fitness coordinator shall be either a member of the fire department or a qualified outside agent.

5.1.3 The health and fitness coordinator shall have access to the fire department physician or other subject matter expert for consultation.

5.1.4 The health and fitness coordinator shall be the administrator of all components of the health-related fitness program.

5.1.5* The health and fitness coordinator shall act as a direct liaison between the fire department physician or other subject matter expert and the fire department.

5.1.6* The health and fitness coordinator shall act as a direct liaison to the fire department's health and safety officer.

5.2* Qualifications for Health and Fitness Coordinator.

5.2.1* The health and fitness coordinator shall have access to appropriate educational materials and formal certification from a professional organization, relevant educational experience, appropriate academic degrees, completion of course work relevant to the program components, or attendance at workshops related to health and fitness.

5.2.2 The health and fitness coordinator shall maintain the continuing education requirements dictated by the coordinator's certifying body or as described in the fire department's job description, whichever sets forth the higher standard.

5.3 Peer Fitness Trainers.

5.3.1 Peer fitness trainers shall work under the direction of the health and fitness coordinator to oversee safe participation in health-related fitness programs.

5.3.2 Peer fitness trainers shall implement and oversee fitness programs for academy recruits as directed by the department health and fitness coordinator.

5.3.3* Peer fitness trainers shall have the level of training and certification required by the fire department and shall maintain their recertification requirements as prescribed by the certifying organization.

Chapter 6 Fitness Assessment

6.1 General.

6.1.1 All members shall participate in a periodic fitness assessment under supervision of the fire department health and fitness coordinator.

6.1.1.1 Members shall discuss any physical limitations or concerns with the health and fitness coordinator in order to assist with the development of an individual exercise prescription.

6.1.1.2 Any medical condition or disease process that can limit a member's ability to safely participate in the annual fitness assessment should be addressed by the fire department physician or the member's treating physician, as appropriate.

6.1.1.3 The member's medical confidentiality shall be respected by the health and fitness coordinator.

6.1.2 The fitness assessment shall be conducted at least annually.

6.2 Fitness Assessment.

6.2.1 All members shall be cleared annually for participation in the fitness assessment by the fire department physician as directed by NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments.*

6.2.2* If a member has an acute medical problem or a newly acquired chronic medical condition, the fitness assessment shall be postponed until that person has recovered from this condition and is cleared as required by 6.2.1.

6.3 Pre-Assessment Questionnaire. The health and fitness coordinator shall administer to all members a pre-assessment questionnaire that seeks to identify contraindications for participation in the fitness assessment and department exercise training program.

6.4* Fitness Assessment Components. The annual fitness assessments shall consist of the following components:

(1) Aerobic capacity
(2) Body composition
(3) Muscular strength
(4) Muscular endurance
(5) Flexibility

Chapter 7 Exercise and Fitness Training Program

7.1* Program Components. The fire department's exercise and fitness training program, administered by the department health and fitness coordinator, shall consist of the following components:

(1) Educational program that describes the components and benefits of exercise on performance and health
(2) Individualized exercise prescription based on the results of the fitness assessment
(3) Warm-up and cool-down exercise guidelines
(4) Aerobic exercise program
(5) Muscular resistance (strength, endurance) exercise program
(6) Flexibility exercise program
(7) Healthy back exercise program
(8) Safety and injury prevention program

7.2 Program Participation.

7.2.1 The fire department physician shall clear all members for participation in the exercise and fitness training program as directed by NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments.*

7.2.2 After a member returns to full duty from a debilitating injury, illness, or any other extended leave, the health and fitness coordinator shall design an individualized exercise and fitness training program under direction of the department physician or other attending health care professional, in order to facilitate restoration of the member's fitness to an optimal level.

Chapter 8 Health Promotion Education

8.1* General Requirements. The fire department shall provide health promotion education as an integral part of the health-related fitness program.

8.1.1* The fire department shall provide for the education of members regarding health risk reduction, general health maintenance, fitness, and the prevention of occupational injuries, illnesses, accidents, or fatalities.

8.1.2* The fire department, under the direction of the fire department physician, shall provide education regarding all of the topics in 8.1.1.

8.1.3 Materials on the matters in 8.1.1 shall be made available to all members on an ongoing basis, with resource materials updated periodically to ensure current information.

8.1.4 The fire department shall provide education and guidance regarding access to the department's member assistance program (MAP) as required by NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.*

8.1.5 The fire department shall encourage all members to obtain ongoing health care from their primary care providers.

Chapter 9 Data Collection

9.1* General. The fire department shall ensure that a confidential fitness program file is established and maintained for each member.

9.2 Statistical Summary. Group statistical data shall be permitted to be used for administrative purposes as long as it is coded so as not to reveal any member's personal information.

9.3* Data Collected. The individual health-related fitness program file shall record the following:

(1) Demographic information
(2) Pre-assessment questionnaire
(3) Fitness assessment
(4) Program participation data

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.1 Although this standard is intended primarily for members involved in emergency operations, fire departments are encouraged to apply the components of the health-related fitness program to all employees.

A.1.2.2 The intent of this program is to promote health and fitness in a "mandatory, nonpunitive" manner. "Mandatory, nonpunitive" implies a program with universal participation; however, failure to achieve defined or individual fitness objectives should not be the basis for any employment sanctions, discipline, or other punitive actions.

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.3.3.4 Fire Department. The term *fire department* includes any public, governmental, private, industrial, or military organization providing these services.

A.3.3.7 Fire Suppression. Fire suppression includes all activities performed at the scene of a fire incident or training exercise that expose fire department members to the dangers of heat, flame, smoke, and other products of combustion, explosion, or structural collapse. [**1500**, 2007]

A.3.3.8 Hazard. Hazards include the characteristics of facilities, equipment, systems, property, hardware, or other objects and the actions and inactions of people that create such hazards.

A.3.3.10 Health and Safety Officer. This individual can also be the incident safety officer or that role can be assigned to another individual as a separate function.

A.3.3.12 Health-Related Fitness Program (HRFP). The health-related fitness program includes fitness assessment, exercise training, and health promotion activities.

A.3.3.17 Member. A fire department member can be a full-time or part-time employee, can be a paid or unpaid volunteer, can occupy any position or rank within the fire department, and might or might not engage in emergency operations.

A.3.3.19 Morbidity. Morbidity refers to the number of sick persons or cases of disease in relationship to a specific population.

A.3.3.25 Standard Operating Procedure. The intent of standard operating procedures is to establish directives that must be followed. Standard operating guidelines allow flexibility in application.

A.4.1.1 The fire department needs to recognize that its members are its most valuable resource. The occupational safety and health program has provided direction on performing assigned functions in a safe manner. The health-related fitness program provides another process, one that allows members to enhance and maintain their optimum level of health and fitness throughout their tenure with the fire department. Education, one provision of a health-related fitness program, allows a means for improving health and fitness throughout the organization. The organization needs to provide the recognition and support to ensure the promotion and success of this process. Health and fitness needs to become a value within the organization, just as safety is a value.

Data suggest a correlation between the following:

(1) A proactive approach to health and fitness and a decrease in debilitating occupational injuries
(2) A reduction in workers' compensation claims and a decrease in acute and chronic health problems of fire fighters

Combining the health-related fitness program with a proactive occupational safety and health program provides a fire department with the level of quality needed for its members.

The purpose of the health-related fitness program is consistent with the medical requirements and occupational safety and health standards, which is to improve the health fitness and overall well-being of fire-fighting personnel. Compliance with the standards of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, has demonstrated that, even in the fire service, benefits will ultimately be manifested in cost savings, decreased sick times, and reduced worker's compensation and disability expenses.

A commitment of time and financial resources is necessary to fulfill requirements of this standard. The fire department should afford individual fire fighters the means, the facility, and the time, as part of their work-time function, to pursue the health-related goals. The initial investment of the fire service on behalf of its most valuable resource, the fire fighter, will pay significant dividends in the future.

A.4.4.2 The fire department should provide an adequate facility for overall fitness, including flexibility, aerobic fitness, and muscular strength, where exercise equipment is centrally located. Such a facility can be developed from the following:

(1) Use of a gym in a commercial facility, high school, university, or other educational institution or private or governmental agency (e.g., military base)
(2) In-house facility equipped through purchased or donated exercise equipment, which can include appropriate equipment obtained from the following resources:
    (a) Made in local apprenticeship programs (e.g., welders or pipefitters)
    (b) Made at and donated by correctional or educational institutions
    (c) Donated by gyms or rehabilitation facilities
    (d) Purchased on a shared cost agreement with the governing city, based on a reduced industrial insurance cost for a fitness program

The fire department should maintain equipment owned or leased by the fire department.

A.4.4.2.1 The fire department can allocate time on duty for physical fitness training. Scheduling of this time can vary due to emergency calls, training, and other activities.

A.5.1.2 The fire department can choose to acquire the services of an outside agent to serve as the health and fitness coordinator. This health and fitness coordinator should meet or exceed the training and educational background listed in A.5.2.1. The fire department should ensure that such an outside agent is familiar with the unique physical stresses present on the fireground.

Appropriate outside agents can be found at local colleges or universities in the exercise science, kinesiology, physical fitness, or fire technology departments. The private sector can also provide qualified personnel to serve as health and fitness coordinators. Such sources include hospital-based fitness programs, medical facilities, or private companies that provide fitness assessment and wellness programs.

A.5.1.5 The data generated through the health-related fitness program can show a correlation between fire fighter fitness and occupational safety and health. Nonidentifying data should be shared to facilitate this correlation. The health and fitness coordinator should confer with the health and safety officer regarding health-related fitness policies and procedures, fitness safety, accident and injury prevention, health promotion, and injury rehabilitation.

A.5.1.6 Communication between the health and fitness coordinator and the department's health and safety officer will ensure that data collection and other requirements of the occupational safety and health program are maintained.

A.5.2 There are no broadly accepted educational standards for health and fitness personnel in the United States. While it would be an unrealistic and unattainable goal to require that all health and fitness coordinators have a baccalaureate or graduate degree in a related discipline, it is important to note the level of formal training such a degree connotes.

A.5.2.1 A number of professional organizations, including those listed in Table A.5.2.1, provide training and educational experiences as well as certification programs for interested persons. It is in the best interests of fire departments to avail themselves of these professional services, as time and resources allow.

Table A.5.2.1 Professional Organizations Providing Training

Organization	Training Program
American College of Sports Medicine	Personal Trainer, Health and Fitness Instructor, Exercise Specialist
American Council on Exercise (ACE)	Personal Trainer
National Strength and Conditioning Association (NSCA)	Certified Strength and Conditioning Specialist (CSCS) or Certified Personal Trainer (CPT)
National Academy of Sports Medicine (NASM)	Personal Trainer

The health and fitness coordinator should have a background in functional anatomy, exercise physiology, exercise testing and prescription, exercise supervision, and leadership.

A.5.3.3 A minimal level of certification can be obtained from American Council on Exercise (ACE) as recommended by the IAFF/IAFC *Wellness-Fitness Initiative*.

A.6.2.2 This requirement is consistent with NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*, regarding postponement of medical evaluation for acute medical problems.

A.6.4 The IAFF in conjunction with the IAFC has developed a *Wellness-Fitness Initiative* for the fire service. The initiative gives a department a template for developing a comprehensive fitness program. (Annex C provides a self-assessment tool for determining fitness levels.) The following examples are from the IAFF/IAFC *Wellness-Fitness Initiative* as well as other fitness assessment protocols, which vary in terms of ease of administration, safety, cost, and predictive value:

(1) Aerobic capacity, including the following:
   (a) 1 mile (1.6 km) walk
   (b) 1.5 mile (2.4 km) run/walk
   (c) 12-minute run
   (d) Step test (various)
   (e) Stairclimbing machine
   (f) Cycle ergometer (various)
   (g) Treadmill (various)

(2) Body composition as follows:
   (a) Skinfold (various)
   (b) Circumference (various)
   (c) Bioimpedance (BIA)
   (d) Hydrostatic weighing
   (e) Body mass index (optional)
   (f) Waist-to-hip ratio (optional)

(3) Muscular strength as follows:
   (a) Handgrip dynometer
   (b) Static bicep curl with dynometer
   (c) Static leg press with dynometer
   (d) Bench press (1 rep maximum or percent of body weight)
   (e) Leg press (1 rep maximum or percent of body weight)

(4) Muscular endurance, including the following:
   (a) Push-ups
   (b) Modified push-ups
   (c) Pull-ups
   (d) Bent knee sit-ups
   (e) Crunches/curl-ups given time or cadence

(5) Flexibility, including the following:
   (a) Sit and reach
   (b) Lateral and rotation movement
   (c) Trunk extension
   (d) Shoulder elevation

A.7.1 Annex B provides further information about each component of the fire department's exercise and fitness training program to assist the health and fitness coordinator in setting up and administering such a program.

A.8.1 Health education is now the driving force of health promotion and disease prevention. In the fall of 1993, the Centers for Disease Control (CDC) formally added "Prevention" to its name. At that time the CDC director announced that prevention's time had come in America. Coincident with this, third-party payors had begun to recognize the value of preventive education and began to reimburse for preventive services and risk reduction counseling. Organizations that establish health care guidelines in this country, such as the U.S. Prevention Services Task Force and American Association of Family Practitioners, unanimously agree that most clinical evaluation time for the average nonpregnant adult should be spent on counseling. It is in that spirit that this technical committee is promoting health education as a major part of the health-related fitness program.

A.8.1.1 It is understood that the degrees of resources vary greatly between fire departments. Despite such differences, adequate low-cost opportunities are universally available to satisfy this standard.

The fire department is encouraged to use an opportunistic team approach in the dissemination of informational materials, fostering, for example, collaboration between the fire department physician, the health and safety officer, and the health and fitness coordinator. Information obtained from the physician could be complemented by that supplied by guest speakers at fire department meetings. The balance of information could be available in the form of pamphlet materials kept in an accessible display case at the firehouse. Most materials are available free of charge through public medical organizations, public health agencies, or private advocacy groups, or can be found on the Internet and downloaded free of charge.

A.8.1.2 Education materials can be in literary or media form and administered in a formal or informal manner on the following topic areas:

(1) Self-examinations, including breast self-exam and testicular self-exam, and reproductive health concerns
(2) Pap smears, annual gynecological exams, colonoscopies, mammograms, and PSA tests
(3) Smoking cessation programs
(4) Cancer risks, including skin cancer (the most common form of cancer), colon cancer, prostate cancer, breast cancer, and lung cancer
(5) Diet and nutrition education, addressing cholesterol, weight management, diabetes, effects of obesity, and balanced diet recommendations
(6) Infectious disease education, including current immunization recommendations for a given age group, as well as general recommendations for the prevention of influenza, hepatitis, tetanus, pneumonia, hepatitis A, tuberculosis, varicella (chicken pox), measles, and rubella
(7) Sexually transmitted disease education, including general recommendations for prevention, diagnosis, and treatment, especially of HIV, hepatitis, herpes, and chlamydia

A.9.1 The primary purpose for maintaining a health-related fitness program file for each participant is to document health-related fitness information for exercise prescription and periodic comparison to previous results. Comparison of new data to previous results will show an individual's progress in attaining a higher level of fitness. Consequently, from analysis and comparison of data, an individual's exercise prescription can be modified. In addition to measuring a participant's progress and providing information for modification of an individual's fitness program, analysis of the organization's set of files, or database, will provide information about organizational progress in developing a health-related fitness program and the need for program modification. Along with providing valuable information about the success of the health-related fitness program, maintenance of the database and its subsequent analysis will provide statistics for program justification.

Electronic data processing is often employed to facilitate management of such a database. BSDI has been recognized by the IAFF/IAFC *Wellness-Fitness Initiative* as the publisher of appropriate software for documenting health-related fitness information.

A.9.3 It is recommended that the health-related fitness program file contain demographic information such as age, gender, ethnicity, years of service, and job assignment, as well as exercise frequency, intensity, duration, and mode information. To ensure consistency and continuity of the process, data should be collected on a standard form such as that shown in Figure A.9.3.

PERSONAL AND DEMOGRAPHIC INFORMATION

Date of submission *(mm/dd/yy)*: _____ Age: _____ Gender: ❑ Male ❑ Female

Fire department confidential identification code: _____

Fire-fighter confidential identification code number: _____

Ethnicity: ❑ African American ❑ Asian ❑ Hispanic ❑ Native American ❑ Filipino ❑ Caucasian ❑ Other

Job assignment: ❑ Structural fire fighting ❑ Administrative officer ❑ Field officer

No. of years in service: _____

Smoking/Tobacco usage *(packs per day)*: ❑ <1 ❑ 1 ❑ 2 ❑ 3 or more ❑ None

Height *(in whole inches)*: _____ Weight *(in whole pounds)*: _____

FITNESS ASSESSMENT

Mode of Testing	Results
Aerobic Capacity	
❑ 1.5 mile walk/run (field test) ❑ Other	Completed in _____ min _____ sec
❑ Step test Test duration _____ Step height _____ ❑ Other	VO_2 max _____
❑ Submaximal treadmill test ❑ Other	Heart rate _____ Blood pressure _____
❑ Submaximal cycle ergometer test ❑ Other	Heart rate _____ Blood pressure _____
Pre-exercise heart rate _____	Post-exercise heart rate _____
Pre-exercise blood pressure _____	Post-exercise blood pressure _____
Flexibility	
❑ Trunk flexion (sit and reach test) ❑ Other	Most distal point reached _____
Muscular Strength	
❑ Grip strength test (one repetition maximum) ❑ Other	Right hand _____ kg Left hand _____ kg

FIGURE A.9.3 Sample Health-Related Fitness Program Form Showing Demographic and Assessment Information.

Mode of Testing	Results
Muscular Endurance	
❑ Push-up test [1 minute (max)] ❑ Other	Maximal number of push-ups performed consecutively without resting _____
❑ Sit-up test [1 minute (max)] ❑ Other	Maximal number of sit-ups performed within 1 minute _____
Body Composition Testing	
Skinfold assessment	Site #1 _____ Site #2 _____ Site #3 _____ Percent of body fat _____
Body mass index (BMI)	Member's weight divided by height^2 = ❑ 20–24.9 kg/m^2 ❑ 25–29.9 kg/m^2 ❑ 30–34.9 kg/m^2 ❑ over 35 kg/m^2
Waist-to-hip ratio	Waist circumference _____ Hip circumference _____ Waist-to-hip ratio _____
Hydrostatic weighing	Body density _____
Bioimpedance (BIA)	Body density _____

FIGURE A.9.3 *Continued*

Annex B Sample Fitness Plan

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

B.1 Components and Benefits of Fitness. The health-related components of fitness focus on the importance of maintaining and increasing an individual's fitness levels, creating positive lifestyle changes, and enhancing job performance. The motor-related components of fitness improve an individual's athletic endeavors or area(s) of motor performance. Health-related and motor-related components of fitness include the following:

(1) Health-related components
  (a) Aerobic capacity
  (b) Muscular strength
  (c) Muscular endurance
  (d) Flexibility
  (e) Body composition
(2) Motor-related components
  (a) Coordination
  (b) Agility
  (c) Power
  (d) Balance
  (e) Speed

B.2 Individualized Exercise Prescription Based on the Fitness Assessment. The components of a basic exercise prescription should include the following:

(1) *Mode:* type of exercise
(2) *Intensity:* difficulty of exercise
(3) *Duration:* length of exercise session
(4) *Frequency:* number of sessions per day or week
(5) *Progression:* gradual increases in workload to promote a training adaptation

The individualized exercise prescription should take into consideration the following concepts:

(1) *Overload.* To create a training effect, the exercise performed must exceed the load the individual normally experiences. Excessive overload can lead to training injuries; therefore, it is best to underestimate workload and err on the side of safety.
(2) *Progression.* As adaptations to the load take place, the load must be progressively increased in order to continue adaptations and improvements. Programs should progress gradually to avoid overtraining and injuries.
(3) *Specificity.* Overload training leads to adaptations in the muscles and the physiological systems. The adaptations are specific to the manner in which the person trains. This

principle of training will be very important for individuals who need to target a specific aspect of fitness.

(4) *Targeting the Improvement of Health and Fitness.* Programs designed to improve health will not necessarily improve fitness. However, any properly designed exercise training program designed to improve fitness will also have a positive impact on overall health. The *Surgeon General's Report on Physical Activity and Health* states that physical activity need not be strenuous to improve health, although greater health and fitness benefits can be achieved by increasing the amount of physical activity. Since a high level of physical fitness is essential for safely performing firefighting duties, a fitness program designed for public safety personnel should promote health and a higher level of physical fitness. The workout regimen should include exercises to improve aerobic capacity and muscular fitness components (i.e., strength, endurance, flexibility).

B.3 Warm-Up and Cool-Down Exercise.

B.3.1 Pre-Exercise (Warm-Up). Each workout session should include at least a 5- to 10-minute warm-up period. The purpose of the warm-up is to increase body temperature while improving the flow of blood and oxygen to the muscles. A warm-up prepares the body for the more strenuous exercise to follow, decreases risk of injury, and improves performance.

B.3.2 Post-Exercise (Cool-Down). A 10- to 15-minute cool-down period should follow each workout. This period includes a gradual tapering of exercise intensity followed by stretching. The purpose of the cool-down is to assist in the return of blood to the heart, thereby reducing cardiac stress. Tapering should be followed by stretching of the affected muscles to promote flexibility and reduce muscle soreness.

B.4 Aerobic Fitness.

B.4.1 Significance. Aerobic exercise has many benefits, including increased aerobic capacity, muscular endurance, improved bone density, and improved body composition. The *Surgeon General's Report on Physical Activity and Health* found that inactivity is hazardous to health. Aerobic exercise generally reduces coronary risk factors, muscle fatigue, injuries, and morbidity. Repeatedly, research has shown the need for fire fighters to have high levels of aerobic fitness in order to perform their job.

B.4.2 Definitions.

B.4.2.1 Aerobic Fitness. Enhancement of the body's ability to take in, transport, and utilize oxygen; improved stamina or ability to carry out muscular activity for a prolonged period of time. Aerobic fitness, also referred to as cardiovascular fitness and cardiorespiratory endurance, is generally measured by the maximal oxygen consumption test (VO_2 max).

B.4.2.2 American College of Sports Medicine (ACSM). A national organization of exercise physiologists and health practitioners who review the body of studies on exercise physiology and present exercise testing guidelines as well as exercise prescription recommendations and position statements.

B.4.2.3 Interval Training. A method of training in which periods of high-intensity effort (work interval) are alternated with periods of lower training intensity or rest (rest interval). These intervals are performed repeatedly for a given number of repetitions. For example, a 1-minute jog (work interval) followed by a 1-minute walk (rest interval), performed a total of 10 times (10 repetitions).

B.4.2.4 Karvonen's Formula. A formula used to predict the heart rates that represent approximately 60 to 85 percent of VO_2 max. This rate is considered an appropriate range to promote aerobic fitness improvements.

B.4.2.5 Maximal Oxygen Consumption Level (VO_2 max). The maximal amount of oxygen that can be consumed and utilized per minute. It is measured in milliliters per kilogram of body weight per minute. Direct or gas exchange VO_2 measurement is considered the best indicator of aerobic fitness. Indirect VO_2 testing is a more common method of assessing aerobic fitness, which typically utilizes a formula to predict VO_2 from time and workload.

B.4.3 Aerobic Exercise Prescription.

B.4.3.1 Mode. Activities that utilize large muscle groups in a rhythmical continuous manner (e.g., walking, running, swimming, cycling, rowing, stairclimbing, skating, dancing, cross-country skiing, rope skipping) are all endurance-based activities. Training can also be carried out in an interval-style fashion. Employing a variety of training modes will reduce the chance of workout boredom and overuse injuries.

Selection of exercise mode should take into consideration the following:

(1) Individual preferences
(2) Availability of proper equipment or facilities
(3) Risk of injury versus benefit of activity
(4) Specificity to occupational demands

Since fire fighters need to support their own body weight and the additional load of protective clothing and breathing apparatus, the most job-specific activities will be those that are weight-bearing, such as walking or stair stepping, in contrast to non-weight-bearing activities such as cycling.

B.4.3.2 Intensity. How hard an individual exercises can be determined by monitoring exercise heart rate, perceived exertion, or caloric expenditure. The ACSM recommends exercising at a heart rate between 70 and 90 percent of maximal heart rate or 60 to 85 percent of VO_2 max, or heart rate reserve. Karvonen's formula, which follows, can be used to calculate the heart rate range that represents approximately 60 to 85 percent of one's VO_2 max. An alternative to this approach calculates a straight percentage (70 to 90 percent) of maximal heart rate. If the maximal heart rate is unknown, it can be predicted by subtracting age from the constant 220.

A second calculation method uses the perception of exertion to determine proper intensity of exercise; exercise should be "somewhat hard" to "hard."

A third method for determining exercise intensity calculates the number of calories burned per minute for a given exercise or for a total exercise period. Generally speaking, activities that burn fewer than 10 calories per minute would represent a low-to-moderate intensity, and activities that burn more than 10 calories per minute would be considered higher intensity.

B.4.4 Karvonen's Formula. To predict training heart rate, use the following formula [Source: *ACSM's Guidelines for Exercise Testing and Prescription* (Chapter 7)]:

$$HR_{trn} = HR_{max} - HR_{rest} \times \%\ \text{intensity} + HR_{rest}$$

where:
HR_{trn} = Training heart rate
HR_{max} = Maximum heart rate = 220 – age
HR_{rest} = Resting heart rate

When determining the proper intensity of exercise, the following must be considered:

(1) Level of fitness
(2) Medications that affect heart rate
(3) Environmental conditions
(4) Risk of cardiovascular or orthopedic injury
(5) Individual objectives and preferences
(6) Job specificity

Studies evaluating fire fighters' heart rate response to fireground activities find that heart rates range from 80 to 90 percent of maximal heart rate or 70 to 80 percent of VO_2 max. Therefore, a fire fighter should consider progressing to a program that includes some high-intensity efforts.

B.4.5 Duration. The duration of the workout can be determined by time, distance, or calories expended. Exercise duration is integrally related to exercise intensity, and together they determine the total number of calories burned in an exercise session. Total caloric expenditure can also be used to help determine exercise intensity and duration.

The ACSM recommends 20 to 60 minutes of continuous activity, excluding the warm-up and cool-down periods. Unfit individuals can benefit from multiple sessions of less than 10 minutes until they are able to withstand training of a longer duration.

B.4.6 Frequency. Exercise frequency is related to the intensity and duration of the exercise program as well as to individual time constraints and goals. Persons with very low fitness levels will benefit from multiple workouts per day, because they have to exercise at a low intensity and short duration due to lack of fitness. Two to three short workouts per day could be most appropriate. The ACSM recommends a minimum of three aerobic workouts per week to improve fitness and two sessions per week to maintain current fitness levels. Workouts should be performed on nonconsecutive days in order to allow adequate recovery between sessions. Weight training exercises can be performed on the days following the aerobic workout.

B.4.7 Weekly Caloric Expenditure. One goal of an exercise program can be a reduction in body fat. The total weekly caloric expenditure, which is determined by exercise intensity, duration, frequency, and mode, can also be used as a tool to determine the exercise prescription. The ACSM recommends a minimal caloric expenditure of 300 calories per exercise session performed three times a week or 200 calories per session performed four times a week. The *Surgeon General's Report on Physical Activity and Health* recommends an accumulated exercise expenditure of 1000 calories per week to improve health. A more optimal level to improve performance is an expenditure of 2000 calories a week.

B.4.8 Rate of Progression. According to the ACSM, the following considerations should be made when determining the proper rate of progression for an individual:

(1) Medical, health, and coronary risk status
(2) Functional capacity
(3) Musculoskeletal conditions
(4) Age
(5) Individual goals and preferences
(6) Specificity to occupational demands

Progressions can come in the form of increases in intensity, duration, and frequency, or a change in mode of exercise (e.g., running instead of cycling). Progressions should be gradual to avoid training injuries.

B.5 Muscle Fitness.

B.5.1 Significance. Components of muscle fitness include muscular strength, endurance, and flexibility. The demands of fire fighting require an above-average level of muscular strength and endurance. Increases in bone, muscle, and connective tissue strength and density decrease the risk of soft tissue injuries. Fire fighters have to be able to pull, drag, and carry heavy loads. Improved muscular fitness will improve job performance and decrease the likelihood of injuries.

B.5.2 Definitions.

B.5.2.1 Maximal Voluntary Contraction (MVC). Maximal amount of weight that can be lifted in a single voluntary muscular contraction.

B.5.2.2 Muscular Endurance. The ability of the muscle to perform repeated contraction for a prolonged period of time; the ability of the muscle to persist.

B.5.2.3 Muscular Strength. The maximal amount of force a muscle or group of muscles can exert in a single contraction; the ability to apply force.

B.5.2.4 National Strength and Conditioning Association (NSCA). A national association of exercise physiologist and health professionals who review the body of information generated on muscle fitness training and provide recommendations and position statements for exercise testing protocols and training programs.

B.5.2.5 Repetition Maximal (RM). The maximal number of repetitions that can be completed with a given weight. For example, if 150 lb (68 kg) is a 10 RM load on the bench press, a person could lift 150 lb (68 kg) at least 10 times but no more than 10 times, using proper lifting form.

B.5.2.6 Repetition (Rep). The lifting and then lowering of a weight.

B.5.2.7 Rest Interval. The period of rest that could include stretching or light activity between sets and different exercises. *(See B.4.2.3, Interval Training.)*

B.5.2.8 Set. A series of repetitions completed without rest.

B.5.3 Muscular Fitness Exercise Prescription.

B.5.3.1 Mode. Free weights, machine weights, circuit training, and calisthenics using body weight or tools and equipment from the fireground (e.g., hose, ladder, bundles), or anything that provides a resistance that the muscles have to overcome can be used to improve muscle fitness. The exercise modalities given here will be separated into the following four groups:

(1) *Free Weights.* Use of free weights (e.g., dumbbells and barbells) requires a balance between the individual and the weight during lifting, which results in a greater use of muscles and the development of better coordination during forceful exertions. Balancing the individual and the weight improves strength transfer to real-life movements, whether for recreational, sport, or work activities. Free weights generally are less expensive to purchase and maintain. A spotter is necessary in several lifts, and the risk of injury can be more serious.
(2) *Circuit Weight Training.* This regimen is a type of interval training in which strength, local muscle endurance, cardiorespiratory endurance, and reductions in body fat can be accomplished. Free weights, machine weights, and

calisthenics can be used in a circuit. Participants perform a series of exercises organized to work all the major muscle groups. The lifting or work period will be 15 to 30 seconds long, and rest intervals between exercises will vary from 15 seconds to 1 minute, depending on which element of fitness is to be emphasized.

(3) *Machine Weights.* Machine weights provide improved convenience of lifting and safety, and they are easier to learn to use than free weights. Additionally, spotters are not necessary. Machine weights do not simulate the real-life lifting situation as well as free weights, but they do improve muscular fitness, which in turn should improve a fire fighter's ability to lift effectively and safely on the fireground. Machine weights are more expensive to purchase and maintain than free weights.

(4) *Calisthenics.* Calisthenics use an individual's body weight to provide resistance to the muscles. Although no special equipment is required and calisthenics are generally quite safe to perform, resistance is limited by an individual's body weight. Therefore, calisthenics are not necessarily as effective for improvements in strength. Job-specific tasks such as pulling a hose or raising a ladder are very specific to job tasks. However, they are not as convenient or safe to use for all training purposes. The load or intensity is often difficult to control or manipulate.

B.5.3.2 Exercise Selection. A combination of all of the modes of training described in B.5.3.1 can be the most beneficial, especially for a fire fighter who needs to train specifically for job tasks but who also desires a safe and convenient exercise program. Regardless of what mode of training is used, a program should be balanced and complete. A minimum of one exercise should be included for each of the following movements:

(1) Upper-body push
(2) Upper-body pull
(3) Lower-body thrust and extension using the hip and knee joint
(4) Knee flexion (hamstrings)
(5) Anterior trunk (abdominal)
(6) Posterior trunk (lower back)

B.5.3.3 Intensity. Using the principle of repetition maximal (RM), the weight or resistance should be such that at least 5 repetitions can be completed, but no more than 20 repetitions can be performed, with a given weight (5–20 RM).

Exceptions would occur during warm-up sets and sets performed by novice lifters, as well as those returning from an injury or individuals with a low fitness level. These types of sets can be performed with lighter loads that would allow more repetitions as follows:

(1) To emphasize the development of strength, a weight that allows 5 to 8 repetitions, or is a 5–8 RM load, should be used. Complete 3 to 6 sets of each exercise.
(2) To emphasize the development of muscular endurance, a weight that allows a minimum of 10 repetitions, or a 10 RM load, should be used. Complete 3 to 6 sets of each exercise.
(3) To emphasize proper warm-up, a light weight that allows 8 to 10 repetitions should be used. Complete 1 to 2 warm-up sets for each exercise.

B.5.3.4 Duration. The total volume of training (i.e., number of exercises, repetitions, and sets completed) should determine exercise duration, which can last from 20 to 90 minutes. The mode of training can also be a factor in determining duration. Circuit training and the use of weight machines can provide a faster workout.

B.5.3.5 Rest Interval Between Workouts. A minimum of 48 hours between workouts of the same muscle should be allowed. Exceptions include the forearms, calf, and abdominal muscles, which can be exercised more frequently.

B.5.3.6 Rest Interval Between Sets and Exercises. More rest between sets and exercises is needed at the beginning of a program, after an injury, during a multijoint lift (e.g., squat), or when lifting heavier weights to emphasize strength. The following guidelines can be used to determine rest intervals between sets and exercises:

(1) *Strength:* 2 to 3 minutes of rest between sets and exercises
(2) *Endurance:* 30 seconds to 2 minutes of rest between sets
(3) *Circuit program:* 15 to 30 seconds of rest between exercises

B.5.3.7 Training Frequency. The ACSM recommends that a minimum of 2 days per week be devoted to muscular fitness training. According to NSCA, improvements can be achieved at a frequency of 2 days per week, but 3 alternating days per week is superior to other training frequencies. Generally speaking, persons who are in good health, have a good training background, and desire muscular endurance and hypertrophy should engage in more frequent training. Persons of questionable health, limited training background, or engaging in heavy training using multijoint exercises designed to increase strength and high-intensity power should train less frequently. Two or more training sessions a week are required to maintain or make gains. The frequency of training depends on all of the following factors:

(1) Initial level of conditioning
(2) Individual goals
(3) Health status of the athlete
(4) Volume and load of exercises
(5) Type of movement performed (multijoint vs. single-joint)

B.5.3.8 Rate of Progression. All exercise programs should start gradually in order to ease through the initial stages of the body's adaptation to the stress of exercise. Resistance training is no exception, as it follows the same stages described in the aerobic training section. *(See B.4.8.)* However, the method of increasing the workout will include one or more of the following factors:

(1) Increased resistance (weight)
(2) Increased repetitions
(3) Increased sets
(4) Decreased rest interval between sets
(5) Increased frequency of training
(6) Change in exercises or training mode

B.6 Flexibility.

B.6.1 Significance. Flexibility measures the range of motion in a joint, which depends on the extensibility of soft tissues (e.g., muscles, tendons, ligaments). Lack of flexibility can hinder physical performance or contribute to an increased risk of injury. Benefits of stretching include the following:

(1) Relaxation from stress and tension
(2) Improved circulation
(3) Relief of lower back pain
(4) Relief of muscle soreness
(5) Improved coordination
(6) Improved job performance
(7) Reduced risk of injury

B.6.2 Definitions.

B.6.2.1 Static Stretch. A slow, gradual, constant stretch in which the end position is held for 10 seconds or longer. Static stretching is easy to learn, safe, and effective and is the recommended stretching mode for fire fighters.

B.6.2.2 Ballistic Stretch. A bouncing movement in which the end position is not held. Ballistic stretching involves a dynamic movement to create a rapid stretch of the muscles. It involves the same types of stretches utilized in static stretching, but it uses rapid or bouncing movements to elongate the muscle. Ballistic stretching can produce injuries to muscles or connective tissue, especially when a previous injury is involved.

B.6.2.3 Dynamic Stretch. Stretching utilizing movement, but including sports-specific movements or simulating a movement pattern used in an activity. Dynamic stretching can be beneficial to include in warm-up after muscles are warm and static stretching has been completed. Ballistic or dynamic stretching should not be substituted for the static mode.

B.6.2.4 Proprioceptive Neuromuscular Facilitation Stretch (PNF). Alternation of muscle contraction and relaxation of both the agonist (muscle being stretched) and antagonist (muscle in opposition to the stretch) muscles, resulting in further relaxation of the muscle being stretched. This interaction results in a decrease in resistance and an increase in the range of motion. This type of stretching generally requires a partner and more time to learn. The partner must be experienced in PNF techniques in order to prevent injuries. Some studies indicate that PNF is superior to static stretching in improving range of motion.

B.6.3 Flexibility Exercise Prescription.

B.6.3.1 Mode. The static stretching technique is safe and effective and is therefore the recommended method of improving flexibility. If personnel trained in the PNF method of training are available, stretching can be even more effective. To stretch the muscle statically and slowly, the muscle should be stretched to a point of tension, not pain, and held for at least 10 seconds. After the initial 10 seconds, the stretch should be lengthened a little further, and held another 10 seconds or longer. Each stretch should be repeated two to three times.

B.6.3.2 Intensity. Individuals should stretch to the point of tension, not pain. "No pain, no gain" definitely does not apply here. The stretch should be felt in the belly of the muscle and not at the joint.

B.6.3.3 Duration. Each stretch should be held at least 10 seconds, then progressed to 30 seconds or longer. Completing a stretching program for the whole body will take approximately 10 to 15 minutes.

B.6.3.4 Frequency. Stretching can and should be done daily. After the initial warm-up, stretching exercises will prepare the body for the more strenuous workout to follow. Stretching after a workout improves flexibility and decreases muscle soreness. A minimum of three stretching workouts a week will generally improve flexibility.

B.6.3.5 Progression. To progress in the flexibility program, increases should be made in the duration of the stretch to more than 10 seconds, in the number of repetitions (up to five repetitions), or in the frequency of stretching. Flexibility can be maintained by stretching at least three times a week, especially before and after workouts. Conducting weight training activities using a full range of motion in each exercise will also help maintain flexibility.

B.6.3.6 Stretching Tips. The following tips can be helpful in making stretching safe and effective:

(1) Always warm up muscles with an activity that elevates heart rate and muscle temperature before stretching.
(2) Cold muscles should not be stretched.
(3) The breath should not be held while stretching. Relaxing and slow breathing should be encouraged.
(4) Proper technique and posture/body alignment should be used when stretching.
(5) Stretching a muscle should be discontinued if a dull ache or burning sensation that could indicate a tissue tear is experienced.

B.7 Healthy Back Exercise Program.

B.7.1 Significance. Approximately 5 million Americans suffer from acute or chronic back pain, which accounts for over 90 million lost production days annually. A report by M. Karter in the *NFPA Journal* found that lower back sprains and strains were the most common type of injury. The physical demands placed on fire fighters puts them at great risk especially if they are not adequately conditioned.

The following are common causes of lower back pain and injury:

(1) Weak abdominal and/or lower back muscles
(2) Inflexible lower back, hamstrings, and hip flexor
(3) Improper posture and body mechanics

B.7.2 Mode. Strengthening and stretching exercises and exercises that improve aerobic fitness to lessen or prevent fatigue are general prescriptions in a healthy back exercise program. Specific exercises to strengthen the lower back, abdominal region, and the muscles in the trunk region are essential. The trunk region is often the weakest link in the body. It is responsible for transferring muscle forces from upper body to lower body, and vice versa, as well as for stabilizing and controlling movements of the spinal column. If lower back pain is consistent or severe, exercising should be discontinued, and the member should be examined by a physician.

B.7.3 Intensity. All exercises should be carried out at a low to moderate intensity. Proper form, not high intensity, should be emphasized. Each exercise should be completed in a slow, controlled manner. All stretching should follow the prescription for static stretching.

B.7.4 Duration. Exercise should continue for 10 to 20 minutes, depending on the number of exercises and stretches.

B.7.5 Frequency. Healthy back exercises should be carried out three to five times a week. As mentioned previously, these exercises can be inserted into any warm-up routine.

B.7.6 Progression. Stretches can be progressed by holding longer and gradually stretching further. Calisthenics and trunk strengthening exercises can be increased by completing more repetitions, or sets, or by adding light weights. The frequency of training can also be increased. Ten minutes of stretching and trunk strengthening exercises three times a week will maintain levels; 30 minutes a week to lessen the risk of a back injury is an excellent time investment. Cardiovascular and weight training exercises will also contribute to maintenance of a healthy back.

B.7.7 Improper Body Mechanics. Improper posture or lifting mechanics are often the result of weak and inflexible muscles. Strengthening the trunk region and improving flexibility will improve body mechanics.

Virtually all lifting tasks involve the legs; therefore, the legs should be strengthened. However, it is crucial for a fire fighter to employ proper lifting techniques even when the load is relatively light. Lifting free weights can help in learning how to lift properly, but specific lifting procedures should be followed for various fireground tasks. The feet should be approximately shoulder width apart, legs bent at the hips and knees, lower back flat or slightly bowed inward, chest and buttocks out, head erect. The power to lift should come from the legs and lower trunk, not the upper body.

B.7.8 Using Weight Belts. Recommendations for strength training involving the use of weight belts are as follows:

(1) For exercises not stressing the back, a belt should not be worn.
(2) For exercises directly stressing the back, a belt should not be worn during lighter sets but always worn for near maximal and maximal sets.
(3) It should never be assumed that a weight belt will afford protection against improper lifting technique.

B.8 Safety and Injury Prevention. The following are general guidelines for prevention of injuries while exercising:

(1) Warm-up and stretching exercises should be performed before a workout. The exercise intensity and stretch should be gradually tapered after a workout.
(2) Members should not overestimate their abilities when beginning an exercise program. Starting out slow and easy and gradually increasing the exercise intensity, duration, or frequency is paramount. Members need to remember that they do not get out of shape overnight and that they cannot get into shape overnight. They need to be patient.
(3) Chronic muscle soreness and fatigue are signs of overtraining. They indicate the need to reduce the workout stimulus, to increase the recovery period between workouts, or both. The body's messages should be heeded.
(4) Properly fitting exercise equipment and clothing should always be worn.
(5) Performing the same workout routine should be avoided. Variety not only reduces boredom but also avoids overuse-type injuries. Periodically changing the modes of exercise, the intensity, and the duration of workouts is required. Changing the exercise stimulus also issues a new challenge to the body, resulting in continued improvements.

Annex C Self-Assessment Tool

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

C.1 General. A self-assessment gives the member valuable feedback on their individual fitness level, ability to recover from exertion, and overall physical capacity as it pertains to the job. It is an evaluation that the member can safely perform in private to provide individualized feedback on personal level of fitness, level of improvement, and physical capacity for exercise. The exercises, weights, repetitions, and aerobic equipment chosen for use in a self-assessment should be similar to the actual job.

A self-assessment can be performed at the workout location with minimal equipment. An assessment should be customized for the member to measure accurately his or her individual ability to perform actual, essential job tasks specific to the routine duties of the department. The information collected from the assessment is valuable to uniformed personnel because it can be compared to previous and future assessments. If an individual's heart rate at 1 minute exceeds 90 percent of the estimated maximum, that individual could lack the reserve necessary to perform safely on the fireground. Similarly, if an individual is unable to complete the repetitions of a particular exercise, that individual could be unable to sufficiently complete the essential task that the exercise simulates. This information should be used to motivate the member to improve any deficiencies noted during the evaluation.

A personalized exercise prescription is a major component of the wellness program. The personalized exercise prescription should be a progressive plan that accounts for an individual's current level of fitness as determined from the self-assessment, job duties, time restrictions, physical capabilities, nutritional status, and self-improvement.

C.2 Example of Circuit Self-Assessment Test. One type of self-assessment is a circuit test. A member who is going to perform a circuit self-assessment test should be medically cleared to participate in the assessment. The member should warm up properly prior to beginning the assessment, then follow the protocol below.

Prior to performing the self-assessment, assemble the following equipment:

(1) Heart rate monitor
(2) Dumbbells [pairs of 15 lb, 20 lb, 30 lb, and 35 lb (7 kg, 9 kg, 14 kg, and 16 kg)]
(3) Treadmill (capable of 5 mph and 15 percent grade)
(4) Lat pulldown machine [set at 80 lb (36 kg)]
(5) Flat bench

Place the equipment conveniently close to the treadmill as you will be returning to this piece of equipment throughout the assessment.

Wet the heart receiver and put it on your chest. Tighten it to a comfortable setting. Turn on the watch and be sure it is receiving your heart rate.

Now you are ready to begin the assessment. Remember that you will be recording both your time and your heart rate. Therefore you should move at as brisk a pace as you feel comfortable between events.

Get your self-assessment worksheet *(see Figure C.2)* and mark the date. Keep this sheet with you as you proceed so you can record your heart rate immediately after each event. Once the test has begun, move from one station to the next with no more than 30 seconds between events. Movements with weights should be through the full range of motion, and both the concentric and eccentric contractions.

The steps of the self-assessment are as follows:

(1) Straddle the treadmill and start the belt. Be sure to set the exercise time for 20 minutes so it can run continually during your evaluation. Set the speed for 3.5 mph while you increase the incline to 15 percent. As soon as the belt reaches 2 mph you can step on the treadmill. Once the incline reaches 15 percent, increase the speed to 5.0 mph. As soon as the speed hits 5.0 mph begin timing your assessment.

SELF-ASSESSMENT WORKSHEET

Name:

Date				
Start Time				
Finish Time				
Exercise	**Heart Rate**			
Treadmill at 15 percent and 5 mph for 1 min.				
DB curls with 15 lb, 24 reps (standing — both arms)				
Treadmill at 15 percent and 3.5 mph for 1 min.				
DB rows with 30 lb, 24 reps (each arm)				
Treadmill at 15 percent and 3.5 mph for 1 min.				
DB military press with 20 lb, 24 reps (standing — alternating arms)				
Treadmill at 15 percent and 3.5 mph for 1 min.				
DB carry with 35 lb, 10 reps (pickup/carry 6 ft)				
Treadmill at 15 percent and 3.5 mph for 1 min.				
Lat pulldown at 80 lb, 24 reps (close grip/palms towards face)				
1 minute of recovery (sitting quietly)				
2 minutes of recovery (sitting quietly)				
3 minutes of recovery (sitting quietly)				
4 minutes of recovery (sitting quietly)				
5 minutes of recovery (sitting quietly)				

FIGURE C.2 Self-Assessment Worksheet.

(2) Run on the treadmill at 5.0 mph on a 15 percent grade for 1 minute. At the end of 1 minute, reduce the speed to 3.5 mph and step off the treadmill. Record your heart rate and move to the 15 lb dumbbells.
(3) Pick up the 15 lb dumbbells and perform 24 biceps curls with both arms simultaneously. Do not swing your arms or upper body. Be sure to move through the full range of motion. After the 24th repetition, record your heart rate and move back to the treadmill.
(4) Walk on the treadmill for 1 minute at 3.5 mph on a 15 percent grade. After 1 minute, record your heart rate and move on to the dumbbell (DB) row.
(5) Place your left knee and left arm on the flat bench and pick up the 30 lb dumbbell with your right hand. Keeping your chest parallel to the ground, pull the dumbbell upward and into your lower chest. Perform 24 repetitions with your right arm. Then place your right knee and right arm on the bench and perform 24 repetitions with your left arm. Record your heart rate and move on to the treadmill.
(6) Walk on the treadmill for 1 minute at 3.5 mph on a 15 percent grade. After 1 minute, record your heart rate and move on to the DB military press.
(7) Pick up the 20 lb dumbbells and in a standing position perform 24 repetitions (with each arm) of alternating military press. Record your heart rate and move on to the treadmill.
(8) Walk on the treadmill for 1 minute at 3.5 mph on a 15 percent grade. After 1 minute, record your heart rate and move on to the DB carry.
(9) Bend down using your legs and pick up both 35 lb dumbbells (one in each hand). Carry the dumbbells to a mark 6 ft away and set them down on the ground. Turn, pick up the dumbbells, and return to where you started. Complete 10 repetitions, with each time you set down the dumbbells counting as one repetition. Record your heart rate and return to the treadmill.
(10) Walk on the treadmill for 1 minute at 3.5 mph on a 15 percent grade. After 1 minute, record your heart rate and move on to the lat pulldown.
(11) Sit down with knees secured and grasp the straight lat pulldown bar with your hands close together and your palms facing you. Pull down in front of your body until the bar reaches your chin. Perform 24 repetitions, being sure to go all the way up. Record your total time and heart rate.
(12) Sit in a quiet location and record your heart rate every minute for 5 minutes.

C.3 Interpreting Your Results. Interpret your results as follows:

(1) Determine 85 percent of your estimated maximum heart rate, which will be the target exercise heart rate, using the following simple Karvonen Method equation:

$$\text{Target exercise heart rate} = 0.85\ (220 - \text{age})$$

Example: The target exercise heart rate of a 40-year-old individual would be 153. [*Target exercise heart rate = 0.85 (220 – 40) = 153*]

(2) Observe your heart rate throughout the test to see if it ever goes over your 85 percent value. If your heart rate is near maximal, it could indicate that you need to work on your cardiovascular conditioning. This indicates that you could have very little reserve if some greater demand occurs on the fireground.
(3) For each event, evaluate whether you completed the required number of repetitions. If you could not complete the required number of repetitions, you need to work on your muscular strength and/or endurance in these muscle groups.
(4) Observe your total time and compare it to your last total time. If your total time for this test is less than your last test and your heart rate response is the same or less, your fitness level has improved.
(5) Observe your 5-minute recovery. A heart rate that recovers quickly is indicative of aerobic fitness. If your 5-minute heart rate is less than your last test, your fitness level has improved.

Annex D Informational References

D.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

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

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

NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*, 2007 edition.

Karter, M., and P. LeBlanc, "1997 Fire Fighter Injury Report," *NFPA Journal*, November/December 1998.

D.1.2 Other Publications.

D.1.2.1 American College of Sports Medicine Publications. American College of Sports Medicine, P.O. Box 1440, Indianapolis, IN 46206-1440.

ACSM's Guidelines for Exercise Testing and Prescription, Lippincott Williams & Wilkins, 7th edition, 2005.

D.1.2.2 IAFF/IAFC Publications. International Association of Fire Fighters, 1750 New York Avenue, NW, Washington, DC 20006; International Association of Fire Chiefs, 4025 Fair Ridge Drive, Fairfax, VA 22033-2868.

The Fire Service Joint Labor Management Wellness-Fitness Initiative, Second edition, 1999.

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

Surgeon General's Report on Physical Activity and Health, 1996.

D.2 Informational References. (Reserved)

D.3 References for Extracts in Informational Sections.

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