

# NFPA® 1582

## Standard on Comprehensive Occupational Medical Program for Fire Departments

### 2013 Edition



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## NFPA® 1582

### Standard on

## Comprehensive Occupational Medical Program for Fire Departments

### 2013 Edition

This edition of NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*, was prepared by the Technical Committee on Fire Service Occupational Safety and Health and acted on by NFPA at its June Association Technical Meeting held June 11–14, 2012, in Las Vegas, NV. It was issued by the Standards Council on August 9, 2012, with an effective date of August 29, 2012, and supersedes all previous editions.

This edition of NFPA 1582 was approved as an American National Standard on August 29, 2012.

### Origin and Development of NFPA 1582

The initial mandatory medical requirements for candidates for fire fighter were in the 1974 edition of NFPA 1001, *Standard on Professional Qualifications for Fire Fighter*. When the first edition of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, was issued in 1987, it required all members engaged in emergency operation to be examined by a physician at least annually and suggested the medical examination be developed and administered by the fire department physician in recognition of the specific requirements of the members' activities.

In the late 1980s, members of the Technical Committee on Fire Fighter Professional Qualifications (responsible for NFPA 1001) and members of the Technical Committee on Fire Service Occupational Safety and Health (responsible for NFPA 1500) formed a working group to develop a new standard on medical requirements for fire fighters.

The first edition of NFPA 1582 was titled *Standard on Medical Requirements for Fire Fighters* and was issued in 1992 under the responsibility of the Fire Service Occupational Safety and Health Committee. A subsequent edition was issued in 1997. The 2000 edition was titled *Standard on Medical Requirements for Fire Fighters and Information for Fire Department Physicians*, in recognition of the increasing amount of guidance being provided in the document to persons serving as fire department physicians.

The title of the 2003 edition was changed to *Standard on Comprehensive Occupational Medical Program for Fire Departments*, to reflect a comprehensive occupational medical program. The document included references to the IAFC-IAFF Fire Service Joint Labor-Management Wellness-Fitness Initiative, and to NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Fighters*. These two documents outline a health-related fitness program that is medically validated against NFPA 1582. The 2003 edition delineated between medical issues of a candidate seeking to become a fire fighter, and those of incumbents currently performing the tasks of fire fighting. The intent with incumbents with a medical condition is to rehabilitate them and only restrict them from performing those essential job tasks where their injury or illness would affect the safety of themselves or others on their crew.

In the 2007 edition, new requirements were added to both the chapter on medical evaluation for candidates and the chapter on specific evaluation of medical conditions in incumbents to allow persons with diabetes to enter the fire service or continue performing essential job tasks associated with fire fighting if they meet defined criteria. All the medical conditions that govern whether a person can become a fire fighter and the specific medical conditions of incumbents that affect their ability to perform certain essential job tasks were reviewed and updated, if appropriate, based on current medical research and knowledge.

For the 2013 edition, the committee, with the assistance of several task groups and subject matter experts in speciality areas with regard to medical conditions, has updated many of the medical requirements to reflect current practices. Some of the areas that were addressed were that of diabetes, metabolic syndrome, prosthetic adjuncts, hearing aids, and cochlear implants, as well as pregnancy and reproductive system concerns. Also developed for the 2013 edition is a new annex designed to assist the end user with the subject of pregnancy. The committee, with the assistance of the International Association of Fire Fighters, has provided an updated Annex C, which contains the protocols for the evaluation of fitness for members. The committee also updated some of the medical requirements relating to hypertension, anticoagulants, TB testing, and screening for cancer.



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**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, and the professional qualifications for Fire Department Safety Officer.

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## 2013 Edition

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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.

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

## Chapter 1 Administration

**1.1 Scope.** This standard contains descriptive requirements for a comprehensive occupational medical program for fire departments.

**1.1.1\*** The medical requirements in this standard are applicable to fire department candidates and members whose job descriptions as defined by the authority having jurisdiction (AHJ) are outlined in NFPA 1001, *Standard for Fire Fighter Professional Qualifications*; NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*; NFPA 1003, *Standard for Airport Fire Fighter Professional Qualifications*; NFPA 1006, *Standard for Technical Rescuer Professional Qualifications*; NFPA 1021, *Standard for Fire Officer Professional Qualifications*; and NFPA 1051, *Standard for Wildland Fire Fighter Professional Qualifications*.

**1.1.2** This standard provides information for physicians and other health care providers responsible for fire department occupational medical programs.

**1.1.3** These requirements are applicable to public, governmental, military, private, and industrial fire department organizations

providing rescue, fire suppression, emergency medical services, hazardous materials mitigation, special operations, and other emergency services.

**1.1.4** This standard shall not apply to industrial fire brigades that also can be known as emergency brigades, emergency response teams, fire teams, plant emergency organizations, or mine emergency response teams.

**1.2 Purpose.** The purpose of this standard is to outline an occupational medical program that, when implemented in a fire department, will reduce the risk and burden of fire service occupational morbidity and mortality while improving the health, and thus the safety and effectiveness, of fire fighters operating to protect civilian life and property.

**1.2.1** Accordingly, the standard specifies the following information:

- (1) Minimal medical requirements for candidates as delineated in Chapter 6
- (2) Occupational medical and fitness evaluations for members as delineated in Chapters 7 and 8
- (3) Information regarding fire department activities and essential job tasks that assist the department physician in providing proper medical support for members
- (4) Methods and types of data that must be collected to sustain comprehensive occupational medical programs for fire departments

**1.2.2 \*** The implementation of the medical requirements outlined in this standard ensures that candidates and current members are medically capable of performing their required duties and will reduce the risk of occupational injuries and illnesses.

**1.2.3** Nothing herein is intended to restrict any jurisdiction from exceeding these minimum requirements.

**1.3 Implementation.**

**1.3.1** For candidates, the medical requirements of this standard shall be implemented when this standard is adopted by an AHJ on an effective date specified by the AHJ.

**1.3.2 \*** When this standard is adopted by a jurisdiction, date(s) shall be set for members to achieve compliance by establishing a phase-in schedule for compliance with specific requirements, if needed.

**1.3.3 \*** The fire department risk management plan as described in NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, shall include implementation of a comprehensive occupational medical program that is compliant with this standard.

## Chapter 2 Referenced Publications

**2.1 General.** The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

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

NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, 2013 edition.

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



NFPA 1003, *Standard for Airport Fire Fighter Professional Qualifications*, 2010 edition.

NFPA 1006, *Standard for Technical Rescuer Professional Qualifications*, 2008 edition.

NFPA 1021, *Standard for Fire Officer Professional Qualifications*, 2009 edition.

NFPA 1051, *Standard for Wildland Fire Fighter Professional Qualifications*, 2012 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2013 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System*, 2008 edition.

NFPA 1581, *Standard on Fire Department Infection Control Program*, 2010 edition.

NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Department Members*, 2008 edition.

NFPA 1584, *Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises*, 2008 edition.

### 2.3 Other Publications.

**2.3.1 ANSI Publications.** American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI Z24.5, *Audiometric Device Testing*, 1951.

**2.3.2 CDC Publications.** Centers for Disease Control and Prevention, 1600 Clifton Road, Atlanta, GA 30333.

“Measles, Mumps, and Rubella — Vaccine Use and Strategies for Elimination of Measles, Rubella, and Congenital Rubella Syndrome and Control of Mumps: Recommendations of the Advisory Committee on Immunization Practices (ACIP),” *Morbidity and Mortality Weekly Report*, May 19, 1998, 47 (No. RR-8): 1-57.

“Poliomyelitis Prevention in the United States: Updated Recommendations of the Advisory Committee on Immunization Practices (ACIP),” *Morbidity and Mortality Weekly Report*, 49(No. RR-5):1-22, May 19, 2000.

**2.3.3 U.S. Government Publications.** U.S. Government Printing Office, Washington, DC 20402.

Title 29, Code of Federal Regulations, Part 1910.95, “Occupational noise exposure,” 1996.

Title 29, Code of Federal Regulations, Part 1910.120, “Hazardous waste operations and emergency response,” 2002.

Title 29, Code of Federal Regulations, Part 1910.134, “Respiratory protection,” 1998.

Title 29, Code of Federal Regulations, Part 1910.1020, “Access to employee exposure and medical records,” 1996.

Title 29, Code of Federal Regulations, Part 1910.1030, “Bloodborne pathogens,” 2001.

U.S. Dept. of Health & Human Services, National Heart, Lung and Blood Institute, *Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure* (JNC 7), 2004

U.S. Dept. of Health & Human Services, National Heart Lung and Blood Institute, *Guidelines for the Diagnosis and Management of Asthma* (EPR-3), June 2007.

**2.3.4 Other Publications.** International Council of Ophthalmology, “International Clinical Diabetic Retinopathy Disease Severity Scale,” San Francisco, CA, October 2002, <http://www.icoph.org/standards/pdrdetail.html>.

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

### 2.4 References for Extracts in Mandatory Sections.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2013 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\* Candidate.** A person who has submitted an application to become a member of the fire department. [1500, 2013]

**3.3.2 Category A Medical Condition.** See 3.3.13.1.

**3.3.3 Category B Medical Condition.** See 3.3.13.2.

**3.3.4 Emergency Medical Services.** The provision of treatment, such as first aid, cardiopulmonary resuscitation, basic life support, advanced life support, and other pre-hospital procedures including ambulance transportation to patients. [1500, 2013]

**3.3.5 Essential Job Task.** Task or assigned duty that is critical to successful performance of the job. (See Chapter 5 and Section 9.1.)

**3.3.6 Evaluation.** See 3.3.14, Medical Evaluation.

**3.3.7 Fire Department Physician.** A 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.

**3.3.8 Functional Capacity Evaluation.** An assessment of the correlation between that individual's capabilities and the essential job tasks.

**3.3.9 Health and Fitness Coordinator.** A 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.

**3.3.10 Health and Safety Committee.** A representative group of individuals who serve along with the fire department physician and health and fitness coordinator, and is chaired by the fire department health and safety officer, who oversee the implementation of the fire department occupational safety and health program.

**3.3.11 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, 2013]

**3.3.12 Infection Control Program.** The fire department's formal policy and implementation of procedures relating to the control of infectious and communicable disease hazards where employees, patients, or the general public could be exposed to blood, body fluids, or other potentially infectious materials in the fire department work environment. [1500, 2013]

### **3.3.13 Medical Condition Classifications.**

**3.3.13.1 Category A Medical Condition.** A medical condition that would preclude a person from performing as a member in a training or emergency operational environment by presenting a significant risk to the safety and health of the person or others.

**3.3.13.2 Category B Medical Condition.** A medical condition that, based on its severity or degree, could preclude a person from performing as a member in a training or emergency operational environment by presenting a significant risk to the safety and health of the person or others.

**3.3.14 Medical Evaluation.** The analysis of information for the purpose of making a determination of medical certification. Medical evaluation includes a medical examination.

**3.3.15 Medical Examination.** An examination performed or directed by the fire department physician.

**3.3.16 Medically Certified.** A determination by the fire department physician that the candidate or current member meets the medical requirements of this standard.

**3.3.17\* Member.** A person involved in performing the duties and responsibilities of a fire department, under the auspices of the organization. [1500, 2013]

**3.3.18 Occupational Safety and Health Program.** An occupation specific program, implemented to reduce the risks associated with the occupation, that outlines the components of a program and the roles and responsibilities of the fire department and its members.

## **EChapter 4 Roles and Responsibilities**

### **4.1 Fire Department Responsibilities.**

**4.1.1** The fire department shall establish a comprehensive occupational medical program that includes medical evaluations for candidates and members. (See Annex B.)

**4.1.2** The medical evaluations and any additional medical tests ordered by the fire department physician shall be provided at no cost to the members.

**4.1.2.1\*** This obligation shall not extend to medical tests beyond the basic medical evaluation for candidates.

**4.1.3** The fire department shall have an officially designated physician who shall be responsible for guiding, directing, and advising the members with regard to their health, fitness, and suitability for duty as required by NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*.

**4.1.4 \*** The fire department shall ensure that the fire department physician is a licensed doctor of medicine or osteopathy

who has completed residency training in an accredited medical training program and/or is American Boards of Medical Specialties (ABMS) or American Osteopathic Association (AOA) board certified or international equivalent.

**4.1.5** The fire department shall provide the fire department physician with a fire service overview, current job descriptions, and the essential job tasks required for all fire department positions and ranks.

**4.1.6** The fire department shall provide the fire department physician with the department's organizational statement that outlines types and levels of services provided by the department, in accordance with NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*.

**4.1.7 \*** The types and levels of services provided by the fire department shall dictate for candidates and members the essential job tasks that pertain to its members and shall therefore be correlated to the medical requirements outlined in this standard.

**4.1.8** For the purpose of conducting medical evaluations, the fire department shall assist the fire department physician to understand the physiological and psychological demands placed on members as well as the environmental conditions under which they must perform and the personal protective equipment (PPE) they must wear during various types of emergency operations.

**4.1.9** The fire department shall ensure member access to evaluation by medical specialists, medical and/or surgical treatment, rehabilitation, and any other intervention prescribed by a medical provider, in consultation with the fire department physician, following an injury or illness resulting from a member's participation in fire department functions.

**4.1.10** The fire department shall require that the fire department health and safety officer and the health and fitness coordinator maintain a liaison relationship with the fire department physician to ensure that all aspects of the comprehensive occupational medical program are actively engaged.

**4.1.11** The fire department shall ensure employee privacy and confidentiality regarding medical conditions identified during the medical evaluation except as required by law.

**4.1.12** Where possible, the fire department shall provide alternate duty position for members when the fire department physician recommends temporary work restrictions.

### **4.1.13 Medical Record Keeping.**

**4.1.13.1\*** The fire department comprehensive occupational medical program shall include collection and maintenance of a confidential medical and health information system for members.

**4.1.13.2** All medical record keeping shall comply with the requirements of 29 CFR 1910.1020, "Access to employee exposure and medical records," and other applicable regulations and laws.

**4.1.14** The provisions of 4.1.13 shall apply to all health and medical records regarding individual members and to all methods of communicating or transferring the information contained in these records, including written, oral, electronic, and any other means of communication.

### **4.2 Fire Department Physician Responsibilities.**

**4.2.1** The fire department physician shall fulfill the following responsibilities:





- (1) Understand the physiological, psychological, and environmental demands placed on fire fighters
- (2) Evaluate fire department candidates and members to identify medical conditions that could affect their ability to safely respond to and participate in emergency operations
- (3) Utilize the essential job task descriptions supplied by the fire department to determine a candidate's or a member's medical certification
- (4) Identify and report the presence of Category A or disqualifying Category B medical conditions if present in candidates
- (5) Inform the fire chief or his/her designee whether or not the candidate or current member is medically certified to safely perform the essential job tasks
- (6) Report the results of the medical evaluation to the candidate or current member, including any medical condition(s) identified during the medical evaluation, and the recommendation as to whether the candidate or current member is medically certified to safely perform the essential job tasks
- (7) Forward copies of any abnormal results along with patient instructions regarding primary care follow-up to candidates or current members who were instructed to seek (as appropriate) medical follow-up to address any medical conditions, or lab abnormalities, identified during the medical evaluation
- (8) Review results of the annual occupational fitness evaluation as described in Chapter 8
- (9) Provide or arrange for a prescriptive rehabilitation and/or fitness program when indicated to aid a member's recovery from illness or injury and enhance his/her ability to safely perform essential job tasks

**4.2.2** When medical evaluations are conducted by a physician or medical provider other than the fire department physician, the evaluation shall be reviewed and approved by the fire department physician.

**4.2.3** The fire department physician shall review individual medical evaluations and aggregate data from member evaluations in order to detect evidence of occupational exposure(s) or clusters of occupational disease.

**4.2.4** The fire department physician shall be a member of the Fire Department Occupational Safety and Health Committee chaired by the health and safety officer as required by NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*.

**4.2.5** The fire department physician shall provide medical supervision for the fire department fitness, return-to-duty rehabilitation, and physical conditioning programs as required by NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Department Members*.

**4.2.6** \* The fire department physician shall ensure adequate on-scene medical support at the incident scene rehabilitation sector for members during emergency operations as required by NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*; NFPA 1561, *Standard on Emergency Services Incident Management System*; and NFPA 1584, *Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises*.

**4.2.7** The fire department physician shall provide supervision for the fire department infection control program as required by NFPA 1581, *Standard on Fire Department Infection Control Program*.

**4.3 Candidate and Member Responsibilities.** Each candidate or member shall adhere to the following requirements:

- (1) Cooperate, participate, and comply with the medical evaluation process
- (2) Provide complete and accurate information to the fire department physician and other authorized medical care provider(s)
- (3) Report any occupational exposure such as exposure to hazardous materials or toxic substances and exposure to infectious or contagious diseases
- (4) Report to the fire department physician any medical condition that could interfere with the ability of the individual to safely perform essential job tasks, such as illness or injury, use of prescription or nonprescription drugs, and pregnancy

#### **4.4 Confidentiality of Medical Information.**

**4.4.1\*** Specific information concerning medical diagnosis shall be released by the fire department physician only with written permission from the candidate or member.

**4.4.2** No fire department personnel, other than the fire department physician or appropriate medical staff, shall have access to another member's medical records without the express written consent of that member.

## **Chapter 5 Essential Job Tasks**

### **5.1 Essential Job Tasks and Descriptions.**

**5.1.1** The fire department shall evaluate the following 13 essential job tasks against the types and levels of emergency services provided to the local community by the fire department, the types of structures and occupancies in the community, and the configuration of the fire department to determine the essential job tasks of fire department members and candidates:

- (1)\*While wearing personal protective ensembles and self-contained breathing apparatus (SCBA), performing fire-fighting tasks (e.g., hoseline operations, extensive crawling, lifting and carrying heavy objects, ventilating roofs or walls using power or hand tools, forcible entry), rescue operations, and other emergency response actions under stressful conditions including working in extremely hot or cold environments for prolonged time periods
- (2) Wearing an SCBA, which includes a demand valve-type positive-pressure facepiece or HEPA filter masks, which requires the ability to tolerate increased respiratory workloads
- (3) Exposure to toxic fumes, irritants, particulates, biological (infectious) and nonbiological hazards, and/or heated gases, despite the use of personal protective ensembles and SCBA
- (4) Depending on the local jurisdiction, climbing six or more flights of stairs while wearing a fire protective ensemble, including SCBA, weighing at least 50 lb (22.6 kg) or more and carrying equipment/tools weighing an additional 20 to 40 lb (9 to 18 kg)
- (5) Wearing a fire protective ensemble, including SCBA, that is encapsulating and insulated, which will result in significant fluid loss that frequently progresses to clinical dehydration and can elevate core temperature to levels exceeding 102.2°F (39°C)

- (6) While wearing personal protective ensembles and SCBA, searching, finding, and rescue-dragging or carrying victims ranging from newborns to adults weighing over 200 lb (90 kg) to safety despite hazardous conditions and low visibility
- (7) While wearing personal protective ensembles and SCBA, advancing water-filled hoselines up to 2½ in. (65 mm) in diameter from fire apparatus to occupancy [approximately 150 ft (50 m)], which can involve negotiating multiple flights of stairs, ladders, and other obstacles
- (8) While wearing personal protective ensembles and SCBA, climbing ladders, operating from heights, walking or crawling in the dark along narrow and uneven surfaces that might be wet or icy, and operating in proximity to electrical power lines or other hazards
- (9) Unpredictable emergency requirements for prolonged periods of extreme physical exertion without benefit of warm-up, scheduled rest periods, meals, access to medication(s), or hydration
- (10) Operating fire apparatus or other vehicles in an emergency mode with emergency lights and sirens
- (11) Critical, time-sensitive, complex problem solving during physical exertion in stressful, hazardous environments, including hot, dark, tightly enclosed spaces, that is further aggravated by fatigue, flashing lights, sirens, and other distractions
- (12) Ability to communicate (give and comprehend verbal orders) while wearing personal protective ensembles and SCBA under conditions of high background noise, poor visibility, and drenching from hoselines and/or fixed protection systems (sprinklers)
- (13) Functioning as an integral component of a team, where sudden incapacitation of a member can result in mission failure or in risk of injury or death to civilians or other team members

**5.1.2** The fire department physician shall consider the physical, physiological, intellectual, and psychological demands of the occupation when evaluating the candidate's or member's ability to perform the essential job tasks.

**5.1.3** Medical requirements for candidates and members shall be correlated with the essential job tasks as determined by 5.1.1.

**5.1.4** The fire department shall provide the fire department physician with the list of essential job tasks to be used in the medical evaluation of members and candidates.

## **5.2 Essential Job Tasks for Specialized Teams.**

**5.2.1** If the fire department operates specialized teams such as hazardous materials units, self-contained underwater breathing apparatus (SCUBA) teams, technical rescue teams, emergency medical services (EMS) teams, or units supporting tactical law enforcement operations, the fire department shall identify for each team it operates additional essential job tasks and specialized personal protective equipment (PPE) not specified in 5.1.1(1) through 5.1.1(13) that would apply to the members of that team.

**5.2.2** The fire department shall provide the fire department physician with the list of essential job tasks and specialized PPE specific to each specialized team.

**5.2.3** When performing the medical evaluation of members of a specialized team, the fire department physician shall consider the following:

- (1) Additional medical and/or physical requirements that are related to the job tasks being performed by the team that are not enumerated in this standard
- (2) The impact on members of having to wear or utilize specialized PPE that can increase weight, environmental isolation, sensory deprivation, and/or dehydration potential above levels experienced with standard fire suppression PPE

## **Chapter 6 Medical Evaluations of Candidates**

**6.1 Medical Evaluation.** A medical evaluation of a candidate shall be conducted prior to the candidate being placed in training programs or fire department emergency response activities.

**6.1.1\*** The medical evaluation of a candidate shall include a medical history, examination, and any laboratory tests required to detect physical or medical condition(s) that could adversely affect his/her ability to safely perform the essential job tasks outlined in 5.1.1.

**6.1.2** \* This standard shall provide specific requirements for candidates based on medical conditions that can affect a candidate's ability to safely perform the essential job tasks of a fire fighter.

## **6.2 Medical Conditions Affecting Ability to Safely Perform Essential Job Tasks.**

**6.2.1** Medical conditions that can affect a candidate's ability to safely perform essential job tasks shall be designated either Category A or Category B.

**6.2.2** Candidates with Category A medical conditions shall not be certified as meeting the medical requirements of this standard.

**6.2.3** Candidates with Category B medical conditions shall be certified as meeting the medical requirements of this standard only if they can perform the essential job tasks without posing a significant safety and health risk to themselves, members, or civilians.

## **6.3 Head and Neck.**

### **6.3.1 Head.**

**6.3.1.1** Category A medical conditions shall include the following:

- (1) Defect of skull preventing helmet use or leaving underlying brain unprotected from trauma
- (2) Any skull or facial deformity that would not allow for a successful fit test for respirators used by that department
- (3) Any head condition that results in the candidate not being able to safely perform one or more of the essential job tasks

**6.3.1.2** Category B medical conditions shall include the following:

- (1)\*Deformities of the skull such as depressions or exostoses
- (2)\*Deformities of the skull associated with evidence of disease of the brain, spinal cord, or peripheral nerves
- (3)\*Loss or congenital absence of the bony substance of the skull



### 6.3.2 Neck.

**6.3.2.1** Category A medical conditions shall include any neck condition that results in the candidate not being able to safely perform one or more of the essential job tasks.

**6.3.2.2** Category B medical conditions shall include the following:

- (1)\*Thoracic outlet syndrome
- (2)\*Congenital cysts, chronic draining fistulas, or similar lesions
- (3)\*Contraction of neck muscles

### 6.4 Eyes and Vision.

**6.4.1** Category A medical conditions shall include the following:

- (1)\*Far visual acuity less than 20/40 binocular, corrected with contact lenses or spectacles, or far visual acuity less than 20/100 binocular for wearers of hard contacts or spectacles, uncorrected
- (2)\*Color perception — monochromatic vision resulting in inability to use imaging devices such as thermal imaging cameras
- (3)\*Monocular vision
- (4) Any eye condition that results in the candidate not being able to safely perform one or more of the essential job tasks

**6.4.2** Category B medical conditions shall include the following:

- (1)\*Diseases of the eye such as retinal detachment, progressive retinopathy, or optic neuritis
- (2)\*Ophthalmological procedures such as radial keratotomy, Lasik procedure, or repair of retinal detachment
- (3) Peripheral vision in the horizontal meridian of less than 110 degrees in the better eye or any condition that significantly affects peripheral vision in *both* eyes

### 6.5\* Ears and Hearing.

**6.5.1** Category A medical conditions shall include the following:

- (1) Chronic vertigo or impaired balance as demonstrated by the inability to tandem gait walk
- (2) On audiometric testing, average hearing loss in the unaided better ear greater than 40 decibels (dB) at 500 Hz, 1000 Hz, 2000 Hz, and 3000 Hz when the audiometric device is calibrated to ANSI Z24.5, *Audiometric Device Testing*
- (3) Any ear condition (or hearing impairment) that results in the candidate not being able to safely perform one or more of the essential job tasks
- (4)\*Hearing aid or cochlear implant

**6.5.2** Category B medical conditions shall include the following:

- (1)\*Unequal hearing loss
- (2) Average uncorrected hearing deficit at the test frequencies 500 Hz, 1000 Hz, 2000 Hz, and 3000 Hz greater than 40 dB in either ear
- (3) Atresia, stenosis, or tumor of the auditory canal
- (4)\*External otitis, recurrent
- (5)\*Agenesis or traumatic deformity of the auricle
- (6)\*Mastoiditis or surgical deformity of the mastoid
- (7)\*Ménière's syndrome, labyrinthitis, or tinnitus
- (8)\*Otitis media, recurrent
- (9) Surgical procedures to correct or improve hearing or other conditions of the ear

### 6.6 Dental.

**6.6.1** Category A medical conditions shall include any dental condition that results in inability to safely perform one or more of the essential job tasks.

**6.6.2** Category B medical conditions shall include the following:

- (1)\*Diseases of the jaws or associated tissues
- (2)\*Orthodontic appliances
- (3)\*Oral tissues, extensive loss
- (4)\*Relationship between the mandible and maxilla that interferes with satisfactory postorthodontic replacement or ability to use protective equipment

### 6.7 Nose, Oropharynx, Trachea, Esophagus, and Larynx.

**6.7.1** Category A medical conditions shall include the following:

- (1)\*Tracheostomy
- (2)\*Aphonia
- (3) Any nasal, oropharyngeal, tracheal, esophageal, or laryngeal condition that results in inability to safely perform one or more of the essential job tasks including fit testing for respirators such as N-95 for medical response, P-100 for particulates and certain vapors, and SCBA for fire and hazmat operations

**6.7.2** Category B medical conditions shall include the following:

- (1)\*Congenital or acquired deformity
- (2)\*Allergic rhinitis
- (3) Epistaxis, recurrent
- (4)\*Sinusitis, recurrent
- (5)\*Dysphonia
- (6) Anosmia
- (7) Tracheal stenosis
- (8) Nasopharyngeal polypsis
- (9)\*Obstructive apneas (e.g., sleep apnea) if unresponsive to treatment

### 6.8 Lungs and Chest Wall.

**6.8.1** Category A medical conditions shall include the following:

- (1) Active hemoptysis
- (2) Current empyema
- (3) Pulmonary hypertension
- (4) Active tuberculosis
- (5)\*A forced vital capacity (FVC) or forced expiratory volume in 1 second (FEV<sub>1</sub>) less than 70 percent predicted even independent of disease
- (6)\*Obstructive lung diseases (e.g., emphysema, chronic bronchitis, asthma) with an absolute FEV<sub>1</sub>/FVC less than 0.70 and with either the FEV<sub>1</sub> below normal or both the FEV<sub>1</sub> and the FVC below normal (less than 0.80) (*see references in F.2*)
- (7)\*Hypoxemia — oxygen saturation less than 90 percent at rest or exercise desaturation by 4 percent or to less than 90 percent (exercise testing indicated when resting oxygen is less than 94 percent but greater than 90 percent)
- (8)\*Asthma — reactive airways disease requiring bronchodilator or corticosteroid therapy for 2 or more consecutive months in the previous 2 years, unless the candidate can meet the requirement in 6.8.1.1
- (9) Any pulmonary condition that results in the candidate not being able to safely perform one or more of the essential job tasks
- (10) Lung transplant

**6.8.1.1\*** A candidate who has in the past required bronchodilator, corticosteroid, or anti-inflammatory therapy (e.g., leukotriene receptor antagonists, such as Montelukast) for asthma but who does not believe he/she has asthma shall be evaluated by a pulmonologist or other expert in asthmatic



lung diseases, such as an allergist, to determine if the candidate meets all the following:

- (1) Asthma has resolved without symptoms off medications for 2 years.
- (2) Allergen avoidance or desensitization has been successful.
- (3) Spirometry demonstrates adequate reserve (FVC and FEV<sub>1</sub> greater than or equal to 90 percent) and no bronchodilator response measured off all bronchodilators on the day of testing.
- (4) Normal or negative response to provocative challenge testing [e.g., cold air, exercise (12 METs), methacholine, histamine, mannitol, or hypertonic saline] or negative response to exercise challenge.

6.8.1.1.1 Challenge testing shall be performed off all anti-inflammatory medications (e.g., inhaled or oral steroids, leukotriene receptor antagonists) for 4 weeks preceding the test, off all antihistamines (e.g., oral allergy medications) for 1 week, and off all bronchodilators on the day of testing.

6.8.2 Category B medical conditions shall include the following:

- (1)\*Pulmonary resectional surgery, chest wall surgery, and pneumothorax
- (2) Pleural effusion
- (3)\*Fibrothorax, chest wall deformity, and diaphragm abnormalities
- (4)\*Interstitial lung diseases
- (5)\*Pulmonary vascular diseases or history of pulmonary embolism
- (6)\*Bronchiectasis, if abnormal pulmonary function or recurrent infections
- (7) Infectious diseases of the lung or pleural space
- (8) Cystic fibrosis
- (9) Central or obstructive apnea (e.g., sleep apnea) if unresponsive to treatment

## 6.9 Aerobic Capacity.

6.9.1\* Category A medical conditions shall include an aerobic capacity less than 12 metabolic equivalents (METs) (12 METs = 42 mL O<sub>2</sub>/kg/min).

## 6.10 Heart and Vascular System.

### 6.10.1 Heart.

6.10.1.1 Category A medical conditions shall include the following:

- (1)\*Coronary artery disease, including history of myocardial infarction, angina pectoris, coronary artery bypass surgery, coronary angioplasty, and similar procedures
- (2)\*Cardiomyopathy or congestive heart failure, including signs or symptoms of compromised left or right ventricular function or rhythm, including dyspnea, S3 gallop, peripheral edema, enlarged ventricle, abnormal ejection fraction, and/or inability to increase cardiac output with exercise
- (3)\*Acute pericarditis, endocarditis, or myocarditis
- (4)\*Syncope, recurrent
- (5)\*A medical condition requiring an automatic implantable cardiac defibrillator or history of ventricular tachycardia or ventricular fibrillation due to ischemic or valvular heart disease, or cardiomyopathy
- (6) Third-degree atrioventricular block
- (7)\*Cardiac pacemaker

- (8) Hypertrophic cardiomyopathy, including idiopathic hypertrophic subaortic stenosis
- (9) Any cardiac condition that results in the candidate not being able to safely perform one or more of the essential job tasks
- (10) Heart transplant

6.10.1.2 Category B medical conditions shall include the following:

- (1)\*Valvular lesions of the heart, including prosthetic valves
- (2)\*Recurrent supraventricular or atrial tachycardia, flutter, or fibrillation
- (3)\*Left bundle branch block
- (4) Second-degree atrioventricular block in the absence of structural heart disease
- (5) Sinus pause more than 3 seconds
- (6)\*Ventricular arrhythmia (history or presence of multifocal PVCs or nonsustained ventricular tachycardia on resting EKG with or without symptoms; history or presence of sustained ventricular tachycardia with or without symptoms)
- (7)\*Cardiac hypertrophy or hypertrophic cardiomyopathy
- (8)\*History of a congenital abnormality
- (9)\*Chronic pericarditis, endocarditis, or myocarditis

### 6.10.2 Vascular System.

6.10.2.1 Category A medical conditions shall include the following:

- (1) Hypertension
  - (a)\*Uncontrolled or poorly controlled hypertension
  - (b)\*Hypertension with evidence of end organ damage
- (2)\*Thoracic or abdominal aortic aneurysm
- (3) Carotid artery stenosis or obstruction resulting in greater than or equal to 50 percent reduction in blood flow
- (4)\*Peripheral vascular disease resulting in symptomatic claudication
- (5) Any other vascular condition that results in inability to safely perform one or more of the essential job tasks

6.10.2.2 Category B medical conditions shall include the following:

- (1) Vasospastic phenomena such as Raynaud's phenomenon
- (2)\*Thrombophlebitis, thrombosis, or varicosities
- (3)\*Chronic lymphedema due to lymphadenopathy or venous valvular incompetency
- (4)\*Congenital or acquired lesions of the aorta or major vessels
- (5)\*Circulatory instability as indicated by orthostatic hypotension, persistent tachycardia, and peripheral vasomotor disturbances
- (6) History of surgical repair of aneurysm of the heart or major vessel

## 6.11 Abdominal Organs and Gastrointestinal System.

6.11.1 Category A medical conditions shall include the following:

- (1) Presence of uncorrected inguinal/femoral hernia regardless of symptoms
- (2) Any gastrointestinal condition that results in the candidate not being able to safely perform one or more of the essential job tasks

6.11.2 Category B medical conditions shall include the following:



- (1)\*Cholecystitis
- (2)\*Gastritis
- (3)\*GI bleeding
- (4)\*Acute hepatitis
- (5) Hernia including the following:
  - (a) Uncorrected umbilical, ventral, or incisional hernia if significant risk exists for infection or strangulation
  - (b) Significant symptomatic hiatal hernia if associated with asthma, recurrent pneumonia, chronic pain, or chronic ulcers
  - (c)\*Surgically corrected hernia more than 3 months after surgical correction
- (6)\*Inflammatory bowel disease or irritable bowel syndrome
- (7)\*Intestinal obstruction
- (8)\*Pancreatitis
- (9) Diverticulitis
- (10)\*History of gastrointestinal surgery
- (11)\*Peptic or duodenal ulcer or Zollinger-Ellison syndrome
- (12)\*Asplenia
- (13)\*Cirrhosis, hepatic or biliary
- (14)\*Chronic active hepatitis

#### 6.12 Metabolic Syndrome.

**6.12.1\*** Category A medical conditions shall include metabolic syndrome with aerobic capacity less than 12 METs.

**6.12.2** Category B medical conditions shall include metabolic syndrome with aerobic capacity 12 METs or greater.

#### 6.13 Reproductive System. See B.1.2.1.

**6.13.1** Category A medical conditions shall include any genital condition that results in inability to safely perform one or more of the essential job tasks.

**6.13.2** Category B medical conditions shall include the following:

- (1)\*Pregnancy, for its duration
- (2) Dysmenorrhea
- (3) Endometriosis, ovarian cysts, or other gynecologic conditions
- (4) Testicular or epididymal mass

#### 6.14 Urinary System.

**6.14.1** Category A medical conditions shall include the following:

- (1) Renal failure or insufficiency requiring continuous ambulatory peritoneal dialysis (CAPD) or hemodialysis
- (2) Any urinary condition that results in the candidate not being able to safely perform one or more of the essential job tasks

**6.14.2** Category B medical conditions shall include the following:

- (1) Diseases of the kidney
- (2) Diseases of the ureter, bladder, or prostate

#### 6.15 Spine and Axial Skeleton.

**6.15.1** Category A medical conditions shall include the following:

- (1) Scoliosis of thoracic or lumbar spine with angle greater than or equal to 40 degrees
- (2) History of spinal surgery with rods that are still in place

- (3) Any spinal or skeletal condition producing sensory or motor deficit(s) or pain due to radiculopathy or nerve root compression
- (4) Any spinal or skeletal condition causing pain that frequently or recurrently requires narcotic analgesic medication
- (5) Cervical vertebral fractures with multiple vertebral body compression greater than 25 percent; evidence of posterior element involvement, nerve root damage, disc involvement, dislocation (partial, moderate, severe), abnormal exam, ligament instability, symptomatic, and/or less than 6 months post injury or less than 1 year since surgery
- (6) Thoracic vertebral fractures with vertebral body compression greater than 50 percent; evidence of posterior element involvement, nerve root damage, disc involvement, dislocation (severe — with or without surgery), abnormal exam, ligament instability, symptomatic, and/or less than 6 months post injury or less than 1 year since surgery
- (7) Lumbosacral vertebral fractures with vertebral body compression greater than 50 percent; evidence of posterior element involvement, nerve root damage, disc involvement, dislocation (partial, moderate, severe), fragmentation, abnormal exam, ligament instability, symptomatic, and/or less than 6 months post injury or less than 1 year since surgery
- (8) Any spinal or skeletal condition that results in the candidate not being able to safely perform one or more of the essential job tasks

**6.15.2** Category B medical conditions shall include the following:

- (1) Congenital or developmental malformations of the back, particularly those that can cause instability, neurological deficits, pain, or limit flexibility
- (2) Scoliosis with angle less than 40 degrees
- (3) Arthritis of the cervical, thoracic, or lumbosacral spine
- (4) Facet atrophism, high lumbosacral angle, hyperlordosis, Schmorl's nodes, Scheuermann's disease, spina bifida occulta, spondylolisthesis, spondylolysis, or transitional vertebrae
- (5) History of infections or infarcts in the spinal cord, epidural space, vertebrae, or axial skeletal joints
- (6) History of discectomy or laminectomy or vertebral fractures
- (7) History of spine fusion that results in instability; reduced mobility, strength, or range of motion; or persistent pain.

#### 6.16 Extremities.

**6.16.1** Category A medical conditions shall include the following:

- (1) Joint replacement, unless all the following conditions are met:
  - (a) Normal range of motion without history of dislocations post-replacement
  - (b) Repetitive and prolonged pulling, bending, rotations, kneeling, crawling, and climbing without pain or impairment
  - (c) No limiting pain
  - (d) Evaluation by an orthopedic specialist who concurs that the candidate can complete all essential job tasks listed in Chapter 5
- (2) Amputation or congenital absence of upper-extremity limb (hand or higher)



- (3) Amputation of either thumb proximal to the mid-proximal phalanx
- (4) Amputation or congenital absence of lower-extremity limb (foot or above) unless the candidate meets all of the following conditions:
  - (a) Stable, unilateral below-the-knee (BKA) amputation with at least the proximal third of the tibia present for a strong and stable attachment point with the prosthesis
  - (b) Fitted with a prosthesis that will tolerate the conditions present in structural firefighting when worn in conjunction with standard fire fighting PPE
  - (c) At least 6 months of prosthetic use in a variety of activities with no functional difficulties
  - (d) Amputee limb healed with no significant inflammation, persistent pain, necrosis, or indications of instability at the amputee limb attachment point
  - (e) No significant psychosocial issues pertaining to the loss of limb or use of prosthesis
  - (f) Evaluated by a prosthetist or orthopedic specialist with expertise in the fitting and function of prosthetic limbs who concurs that the candidate can complete all essential job tasks listed in Chapter 5, including wearing personal protective ensembles and SCBA while climbing ladders, operating from heights, and walking or crawling in the dark along narrow and uneven surfaces that may be wet or icy
  - (g) Has passed the department's applicant physical ability test as a condition of appointment without accommodations or modification of the protocol
- (5) Chronic nonhealing or recent bone grafts
- (6) History of more than one dislocation of shoulder without surgical repair or with history of recurrent shoulder disorders within the last 5 years with pain or loss of motion, and with or without radiographic deviations from normal
- (7) Any extremity condition that results in the candidate not being able to safely perform one or more of the essential job tasks

**6.16.2** Category B medical conditions shall include the following:

- (1)\*History of shoulder dislocation with surgical repair
- (2) Significant limitation of function of shoulder, elbow, wrist, hand, or finger due to weakness, reduced range of motion, atrophy, unequal length, absence, or partial amputation
- (3) Significant lack of full function of hip, knee, ankle, foot, or toes due to weakness, reduced range of motion, atrophy, unequal length, absence, or partial amputation
- (4)\*History of meniscectomy or ligamentous repair of knee
- (5)\*History of intra-articular, malunited, or nonunion of upper or lower extremity fracture
- (6)\*History of osteomyelitis, septic, or rheumatoid arthritis
- (7) Bone hardware such as metal plates or rods supporting bone during healing

**6.17 Neurological Disorders.**

**6.17.1** Category A medical conditions shall include the following:

- (1) Ataxias of heredo-degenerative type
- (2) Cerebral arteriosclerosis as evidenced by a history of transient ischemic attack, reversible ischemic neurological deficit, or ischemic stroke
- (3) Hemiparesis or paralysis of a limb

- (4)\*Multiple sclerosis with activity or evidence of progression within previous 3 years
- (5)\*Myasthenia gravis with activity or evidence of progression within previous 3 years
- (6) Progressive muscular dystrophy or atrophy
- (7) Uncorrected cerebral aneurysm
- (8) All single unprovoked seizures and epileptic conditions, including simple partial, complex partial, generalized, and psychomotor seizure disorders other than as allowed in 6.17.1.1
- (9) Dementia (Alzheimer's and other neurodegenerative diseases) with symptomatic loss of function or cognitive impairment (e.g., less than or equal to 28 on Mini-Mental Status Exam)
- (10) Parkinson's disease and other movement disorders resulting in uncontrolled movements, bradykinesia, or cognitive impairment (e.g., less than or equal to 28 on Mini-Mental Status Exam)
- (11) Any neurological condition that results in the candidate not being able to safely perform one or more of the essential job tasks

**6.17.1.1** To be medically qualified a candidate shall meet all of the following:

- (1) No seizures for 1 year off all anti-epileptic medication or 5 years seizure free on a stable medical regimen
- (2) Neurologic examination is normal
- (3) Imaging (CAT or MRI scan) studies are normal
- (4) Awake and asleep EEG studies with photic stimulation and hyperventilation are normal
- (5) A definitive statement from a qualified neurological specialist that the candidate meets the criteria specified in 6.17.1.1(1) through 6.17.1.1(4) and that the candidate is neurologically cleared for fire-fighting training and the performance of a fire fighter's essential job tasks

**6.17.2** Category B medical conditions shall include the following:

- (1) Congenital malformations
- (2)\*Migraine
- (3) Clinical disorders with paresis, dyscoordination, deformity, abnormal motor activity, abnormality of sensation, or complaint of pain
- (4) History of subarachnoid or intraparenchymal hemorrhage
- (5) Abnormalities from recent head injury such as severe cerebral contusion or concussion

**6.18 Skin.**

**6.18.1** Category A medical conditions shall include the following:

- (1) Metastatic or locally extensive basal or squamous cell carcinoma or melanoma
- (2) Any dermatologic condition that would not allow for a successful fit test for any respirator required by the fire department
- (3) Any dermatologic condition that results in the candidate not being able to safely perform one or more of the essential job tasks

**6.18.2** Category B medical conditions shall include the following:

- (1)\*Skin conditions of a chronic or recurrent nature (eczema, cystic acne, psoriasis) that cause skin openings or inflammation or irritation of the skin surface



- (2)\*Surgery or skin grafting
- (3)\*Mycosis fungoides
- (4)\*Cutaneous lupus erythematosus
- (5)\*Raynaud's phenomenon
- (6)\*Scleroderma (skin)
- (7)\*Vasculitic skin lesions
- (8)\*Atopic dermatitis/eczema
- (9)\*Contact or seborrheic dermatitis
- (10)\*Stasis dermatitis
- (11)\*Albinism, Darier's disease, ichthyosis, Marfan syndrome, neurofibromatosis, and other genetic conditions
- (12)\*Folliculitis, pseudo-folliculitis, miliaria, keloid folliculitis
- (13)\*Hidradenitis suppurativa, furuncles, carbuncles, or Grade IV acne (cystic)
- (14)\*Mechano-bullous disorders (epidermolysis bullosa, Hailey pemphigus, porphyria, pemphigoid)
- (15)\*Urticaria or angioedema

### 6.19 Blood and Blood-Forming Organs.

**6.19.1** Category A medical conditions shall include the following:

- (1) Hemorrhagic states requiring replacement therapy
- (2) Sickle cell disease (homozygous)
- (3) Clotting disorders
- (4) Any hematological condition that results in inability to safely perform one or more of the essential job tasks

**6.19.2** Category B medical conditions shall include the following:

- (1) Anemia
- (2) Leukopenia
- (3) Polycythemia vera
- (4) Splenomegaly
- (5) History of thromboembolic disease
- (6) Any other hematological condition that results in inability to safely perform essential job tasks

### 6.20 Endocrine and Metabolic Disorders.

**6.20.1** Category A medical conditions shall include the following:

- (1)\*Type 1 diabetes mellitus, unless a candidate meets all of the following criteria:
  - (a) Is maintained by a physician knowledgeable in current management of diabetes mellitus on a basal/bolus (can include subcutaneous insulin infusion pump) regimen using insulin analogs.
  - (b) Has demonstrated over a period of at least 6 months the motivation and understanding required to closely monitor and control capillary blood glucose levels through nutritional therapy and insulin administration. Assessment of this shall take into consideration the erratic meal schedules, sleep disruption, and high aerobic and anaerobic workloads intrinsic to fire fighting.
  - (c) Has a dilated retinal exam by a qualified ophthalmologist or optometrist that shows no higher grade of diabetic retinopathy than microaneurysms, as indicated on the International Clinical Diabetic Retinopathy Disease Severity Scale.
  - (d) Has normal renal function based on a calculated creatinine clearance greater than 60 mL/min and absence of proteinuria. (Creatinine clearance can be calculated by use of the Cockcroft-Gault or similar formula.

Proteinuria is defined as 24-hour urine excretion of greater than or equal to 300 mg protein or greater than or equal to 300 mg of albumin per gram of creatinine in a random sample.)

- (e) Has no autonomic or peripheral neuropathy. (Peripheral neuropathy is determined by diminished ability to feel the vibration of a 128 cps tuning fork or the light touch of a 10-gram monofilament on the dorsum of the great toe proximal to the nail. Autonomic neuropathy might be determined by evidence of gastroparesis, postural hypotension, or abnormal tests of heart rate variability.)

- (f) Has normal cardiac function without evidence of myo- Category A and B Medical Conditions cardiac ischemia on cardiac stress testing (to at least 12 MET) by ECG and cardiac imaging.

- (g) Has a signed statement and medical records from an endocrinologist or a physician with demonstrated knowledge in the current management of diabetes mellitus as well as knowledge of the essential job tasks and hazards of fire fighting as described in 5.1.1, allowing the fire department physician to determine whether the candidate meets the following criteria:

- i. Is being successfully maintained on a regimen consistent with 6.20.1(1)(a) and 6.20.1(1)(b).
- ii. Has had hemoglobin A1C measured at least four times a year (intervals of 2 to 3 months) over the last 12 months prior to evaluation if the diagnosis of diabetes has been present over 1 year. A hemoglobin A1C reading of 8 percent or greater shall trigger a medical evaluation to determine if a condition exists in addition to diabetes that is responsible for the hemoglobin A1C not accurately reflecting average glucose levels. This shall include evidence of a set schedule for blood glucose monitoring and a thorough review of data from such monitoring.
- iii. Does not have an increased risk of hypoglycemia due to alcohol use or other predisposing factors.
- iv.\*Has had no episodes of severe hypoglycemia (defined as requiring assistance of another) in the preceding 1 year, with no more than two episodes of severe hypoglycemia in the preceding 3 years.
- v. Is certified not to have a medical contraindication to fire-fighting training and operations.

- (2) Insulin-requiring Type 2 diabetes mellitus, unless a candidate meets all of the following criteria:
  - (a) Is maintained by a physician knowledgeable in current management of diabetes mellitus.
  - (b) Has demonstrated over a period of at least 3 months the motivation and understanding required to closely monitor and control capillary blood glucose levels through nutritional therapy and insulin administration. Assessment of this shall take into consideration the erratic meal schedules, sleep disruption, and high aerobic and anaerobic workloads intrinsic to fire fighting.
  - (c) Has a dilated retinal exam by a qualified ophthalmologist or optometrist that shows no higher grade of diabetic retinopathy than microaneurysms, as indicated on the International Clinical Diabetic Retinopathy Disease Severity Scale.
  - (d) Has normal renal function based on a calculated creatinine clearance greater than 60 mL/min and absence of proteinuria. (Creatinine clearance can be calculated by

use of the Cockcroft-Gault or similar formula. Proteinuria is defined as 24-hour urine excretion of greater than or equal to 300 mg protein or greater than or equal to 300 mg of albumin per gram of creatinine in a random sample.)

- (e) Has no autonomic or peripheral neuropathy. (Peripheral neuropathy is determined by diminished ability to feel the vibration of a 128 cps tuning fork or the light touch of a 10-gram monofilament on the dorsum of the great toe proximal to the nail. Autonomic neuropathy can be determined by evidence of gastroparesis, postural hypotension, or abnormal tests of heart rate variability.)
- (f) Has normal cardiac function without evidence of myocardial ischemia on cardiac stress testing (to at least 12 METS) by ECG and cardiac imaging.
- (g) Has a signed statement and medical records from an endocrinologist or a physician with demonstrated knowledge in the current management of diabetes mellitus as well as knowledge of the essential job tasks and hazards of fire fighting as described in 5.1.1, allowing the fire department physician to determine whether the candidate meets the following criteria:
  - i. Is maintained on a stable insulin regimen and has demonstrated over a period of at least 3 months the motivation and understanding required to closely monitor and control capillary blood glucose levels despite varied activity schedules through nutritional therapy and insulin administration.
  - ii. Has had hemoglobin A1C measured at least four times a year (intervals of 2 to 3 months) over the last 12 months prior to evaluation if the diagnosis of diabetes has been present over 1 year. A hemoglobin A1C reading of 8 percent or greater shall trigger a medical evaluation to determine if a condition exists in addition to diabetes that is responsible for the hemoglobin A1C not accurately reflecting average glucose levels. This shall include evidence of a set schedule for blood glucose monitoring and a thorough review of data from such monitoring.
  - iii. Does not have an increased risk of hypoglycemia due to alcohol use or other predisposing factors.
  - iv.\*Has had no episodes of severe hypoglycemia (defined as requiring assistance of another) in the preceding 1 year, with no more than two episodes of severe hypoglycemia in the preceding 3 years
  - v. Is certified not to have a medical contraindication to fire-fighting training and operations.
- (3) Any endocrine or metabolic condition that results in the candidate not being able to safely perform one or more of the essential job tasks

**6.20.2** Category B medical conditions shall include the following:

- (1)\*Diseases of the adrenal gland, pituitary gland, parathyroid gland, or thyroid gland of clinical significance
- (2) Nutritional deficiency diseases or other metabolic disorder
- (3) Diabetes mellitus, not on insulin therapy, but controlled by diet, exercise, and/or oral hypoglycemic agents unless all of the following are met:

- (a) Has had hemoglobin A1C measured at least four times a year (intervals of 2 to 3 months) over the last 12 months prior to evaluation if the diagnosis of diabetes has been present over 1 year. A hemoglobin A1C reading of 8 percent or greater shall trigger a medical evaluation to determine if a condition exists in addition to diabetes that is responsible for the hemoglobin A1C not accurately reflecting average glucose levels. This shall include evidence of a set schedule for blood glucose monitoring and a thorough review of data from such monitoring.
- (b) If on oral hypoglycemic agents, has had no episodes of severe hypoglycemia (defined as requiring assistance of another) in the preceding year.
- (c) Has a dilated retinal exam by a qualified ophthalmologist or optometrist that shows no higher grade of diabetic retinopathy than microaneurysms, as indicated on the International Clinical Diabetic Retinopathy Disease Severity Scale.
- (d) Has normal renal function based on a calculated creatinine clearance greater than 60 mL/min and absence of proteinuria. (Creatinine clearance can be calculated by use of the Cockcroft-Gault or similar formula. Proteinuria is defined as 24-hour urine excretion of greater than or equal to 300 mg protein or greater than or equal to 300 mg of albumin per gram of creatinine in a random sample.)
- (e) Has no autonomic or peripheral neuropathy. (Peripheral neuropathy is determined by diminished ability to feel the vibration of a 128 cps tuning fork or the light touch of a 10-gram monofilament on the dorsum of the great toe proximal to the nail. Autonomic neuropathy can be determined by evidence of gastroparesis, postural hypotension, or abnormal tests of heart rate variability.)
- (f) Normal cardiac function without evidence of myocardial ischemia on cardiac stress testing (to at least 12 METs) by ECG and cardiac imaging.

## **6.21 Systemic Diseases and Miscellaneous Conditions.**

**6.21.1** Category A medical conditions shall include any systemic condition that results in the candidate not being able to safely perform one or more of the essential job tasks.

**6.21.2** Category B medical conditions shall include the following:

- (1) Connective tissue disease, such as dermatomyositis, systemic lupus erythematosus, scleroderma, and rheumatoid arthritis
- (2)\*History of thermal, chemical, or electrical burn injury with residual functional deficit
- (3) Documented evidence of a predisposition to recurrent heat stress rhabdomyolysis, metabolic acidosis, or exertion-related incapacitation

## **6.22 Tumors and Malignant Diseases.**

**6.22.1** Category A medical conditions shall include the following:

- (1) Malignant disease that is newly diagnosed, untreated, or currently being treated, or under active surveillance due to the increased risk for recurrence
- (2) Any tumor or similar condition that results in the candidate not being able to safely perform one or more of the essential job tasks





**6.22.2** Category B medical conditions shall be evaluated on the basis of an individual's current physical condition and on the staging and prognosis of the malignancy (i.e., likelihood that the disease will recur or progress), and include the following:

- (1)\*Benign tumors
- (2)\*History of CNS tumor or malignancy
- (3)\*History of head and neck malignancy
- (4)\*History of lung cancer
- (5)\*History of GI or GU malignancy
- (6)\*History of bone or soft tissue tumors or malignancies
- (7)\*History of hematological malignancy

### **6.23 Psychiatric Conditions.**

**6.23.1** Category A medical conditions shall include any psychiatric condition that results in the candidate not being able to safely perform one or more of the essential job tasks.

**6.23.2** Category B medical conditions shall include the following:

- (1) A history of psychiatric condition or substance abuse problem
- (2) Requirement for medications that increase an individual's risk of heat stress, or other interference with the ability to safely perform essential job tasks

### **6.24 Chemicals, Drugs, and Medications.**

**6.24.1** Category A medical conditions shall include those that require chronic or frequent treatment with any of the following medications or classes of medications:

- (1) Narcotics, including methadone
- (2) Sedative-hypnotics
- (3) Full-dose or low-dose anticoagulation medications or any drugs that prolong prothrombin time (PT), partial thromboplastin time (PTT), or international normalized ratio (INR)
- (4) Beta-adrenergic blocking agents at doses that prevent a normal cardiac rate response to exercise, high-dose diuretics, or central acting antihypertensive agents (e.g., clonidine)
- (5)\*Respiratory medications: inhaled bronchodilators, inhaled corticosteroids, systemic corticosteroids, theophylline, and leukotriene receptor antagonists (e.g., Montelukast)
- (6) High-dose corticosteroids for chronic disease
- (7) Anabolic steroids
- (8) Any chemical, drug, or medication that results in the candidate not being able to safely perform one or more of the essential job tasks

**6.24.1.1** Tobacco use shall be a Category A medical condition (where allowed by law).

**6.24.1.2** Evidence of illegal drug use detected through testing, conducted in accordance with Substance Abuse and Mental Health Service Administration (SAMHSA), shall be a Category A medical condition.

**6.24.1.3** Evidence of clinical intoxication or a measured blood alcohol level that exceeds the legal definition of intoxication according to the AHJ at the time of medical evaluation shall be a Category A medical condition.

**6.24.2\*** Category B medical conditions shall include the use of the following:

- (1) Cardiovascular agents
- (2) Stimulants
- (3) Psychiatric medications

- (4) Other than high-dose systemic corticosteroids
- (5) Antihistamines
- (6) Muscle relaxants
- (7) Leukotriene receptor antagonists (e.g., Montelukast) used for allergies that do not affect the lower respiratory system

## **Chapter 7 Occupational Medical Evaluation of Members**

### **7.1 General.**

**7.1.1** The fire department shall establish and maintain a confidential occupational medical evaluation program for members.

**7.1.2** Occupational medical evaluations shall be conducted as a baseline for surveillance and annually thereafter.

**7.1.3** \* An occupational medical evaluation shall be performed following a member's occupational exposure, illness, injury, or protracted absence from the job.

**7.1.3.1** The scope of that evaluation shall be determined by the fire department physician after reviewing the type and severity of the condition.

**7.1.4** The components of the medical evaluations shall conform to all applicable U.S. OSHA standards, including 29 CFR 1910.120, "Hazardous waste operations and emergency response"; 29 CFR 1910.134, "Respiratory protection"; 29 CFR 1910.95, "Occupational noise exposure"; and 29 CFR 1910.1030, "Bloodborne pathogens."

### **7.2 Member Education Regarding Occupational Medical Evaluation Program.**

**7.2.1** The fire department, the fire department physician, and member organizations where they exist shall be responsible to convey the purposes and importance of the annual occupational medical evaluation to members and to the AHJ.

**7.2.2** The purpose of the annual occupational medical evaluation of members shall include but cannot be limited to the following:

- (1) Identifying conditions that interfere with a member's physical or mental ability to safely perform essential job tasks without undue risk of harm to self or others
- (2) Monitoring the effects of exposure to specific biological, physical, or chemical agents on individual members
- (3) Detecting changes in a member's health that can be related to harmful working conditions
- (4) Detecting patterns of disease or injury occurrence in the workforce that could indicate underlying work-related problems
- (5)\*Providing members with information about their current health, promoting wellness, and referring them for appropriate further evaluation and treatment
- (6) Providing members with information and education about occupational hazards
- (7) Providing a cost-effective investment in work-related disease prevention, early detection, and health promotion for members
- (8) Complying with federal, state, provincial, local, and/or other jurisdictional requirements

### **7.3 Timing of the Annual Occupational Medical Evaluation of Members.**

**7.3.1** All members shall receive a baseline medical evaluation after hiring and prior to performing fire fighter emergency functions and at least annually thereafter.

**7.3.2** The baseline medical evaluation shall include the components of the annual occupational medical evaluation not performed as part of the candidate medical evaluation, provided the candidate medical evaluation was performed within the past 12 months.

**7.3.3** The annual evaluation shall be completed every 12 months ( $\pm 3$  months).

**7.3.4** Annual medical evaluations shall be compared to baseline and subsequent evaluations to identify clinically relevant changes.

**7.3.5** The interval requirements for performance of the annual occupational medical evaluation shall not preclude more frequent medical evaluations of members for new or recurring conditions when requested by the member, fire department physician, or AHJ.

#### **7.4 Components of the Annual Occupational Medical Evaluation of Members.**

**7.4.1** All components listed in Section 7.5 through Section 7.7 shall be included in the baseline and annual occupational medical evaluations of members.

**7.4.2** It shall be acceptable for certain components of the annual occupational medical evaluation to be performed by a member's private physician, provided full results are forwarded in the required time frame to the fire department physician.

**7.4.3** Each medical evaluation shall include a medical history (including exposure history), physical examination, blood tests, urinalysis, vision tests, audiograms, spirometry, chest x-ray (as indicated), ECG, cancer screening (as indicated), and immunizations and infectious disease screening (as indicated).

**7.4.4** Tests for illegal drugs shall not be performed as part of the annual medical evaluation.

#### **7.5 Medical History.**

**7.5.1** A medical history questionnaire shall be completed by each member to provide baseline information with which to compare future medical concerns.

**7.5.2** An annual medical history questionnaire, which includes changes in health status and known occupational exposures since the previous annual evaluation, shall be completed by each member to provide follow-up information.

**7.5.3** Information on the questionnaire and interval concerns shall be reviewed with each member by the fire department physician or designated medical evaluator.

**7.6 Physical Examination.** The annual physical examination shall include each of the following components:

- (1) Vital signs [temperature, pulse, and respiratory rate, and blood pressure (BP)]
  - (a) BP shall be measured according to the recommendations of the *Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure* (JNC 7)
- (2) Head, eyes, ears, nose, and throat (HEENT)
- (3) Neck
- (4) Cardiovascular
- (5) Pulmonary
- (6) Breast

- (7) Gastrointestinal with digital rectal exam as clinically indicated
- (8) Genitourinary (includes pap smear, testicular exam, rectal exam for prostate mass)
- (9) Hernia
- (10) Lymph nodes
- (11) Neurological
- (12) Musculoskeletal
- (13) Skin (includes screening for cancers)
- (14) Vision

#### **7.7 Ancillary Tests.**

**7.7.1\* Blood Tests.** Blood tests shall be performed annually and shall include the following:

- (1) CBC with differential, RBC indices and morphology, and platelet count
- (2) Electrolytes (Na, K, Cl,  $\text{HCO}_3$ , or  $\text{CO}_2$ )
- (3) Renal function (BUN, creatinine)
- (4) Glucose
- (5) Liver function tests (ALT, AST, direct and indirect bilirubin, alkaline phosphatase)
- (6) Total cholesterol, HDL, LDL, clinically useful lipid ratios (e.g., percent LDL), and triglycerides

**7.7.2 Urine Laboratory Tests.** The urine laboratory tests required shall include the following:

- (1) Dipstick analysis for glucose, ketones, leukocyte esterase, protein, blood, and bilirubin
- (2) Microscopic analysis for RBC, WBC, casts, and crystals if indicated by results of dipstick analysis
- (3) Analysis for occupational chemical exposure if indicated

**7.7.3 Audiology.** Hearing thresholds shall be assessed annually in each ear at each of the following frequencies:

- (1) 500 Hz
- (2) 1000 Hz
- (3) 2000 Hz
- (4) 3000 Hz
- (5) 4000 Hz
- (6) 6000 Hz
- (7) 8000 Hz

**7.7.3.1** The fire department physician or other qualified medical evaluator shall compare audiogram results obtained during yearly evaluations with baseline and subsequent test results.

**7.7.3.2** Standard threshold shifts shall be corrected for age as permitted by OSHA.

#### **7.7.4 Spirometry.**

**7.7.4.1\* Pulmonary function testing (spirometry)** shall be conducted annually to measure the member's forced vital capacity (FVC), forced expiratory volume in 1 second ( $\text{FEV}_1$ ), and the absolute  $\text{FEV}_1/\text{FVC}$  ratio.

**7.7.4.2** The fire department physician or other qualified medical evaluator shall compare spirometry results obtained during yearly evaluations with baseline and subsequent test results.

**7.7.4.3** \* $\text{FEV}_1$  and FVC results shall be expressed as the absolute value (liters or milliliters) and as percent predicted adjusted for gender, age, height, and ethnicity using NHANES III normative equations.



### 7.7.5 Chest Radiographs.

7.7.5.1 Chest x-rays shall include an initial baseline and shall be repeated every 5 years or as medically indicated.

7.7.5.2 The fire department physician or other qualified medical evaluator shall compare any chest radiographs with baseline and subsequent radiographs.

### 7.7.6 Electrocardiograms (ECGs).

7.7.6.1 A resting ECG shall be performed as part of the baseline medical evaluation and shall be performed annually thereafter.

7.7.6.2 The fire department physician or other qualified medical evaluator shall compare baseline and subsequent ECGs.

7.7.6.3 \* Stress tests with ECGs and with or without imaging (echocardiography or radionuclide scanning) shall be performed when clinically indicated by history or symptoms.

7.7.6.4 These tests shall be based on coronary artery disease risk factor stratification or symptoms or for screening of cardiovascular disease and the risk of sudden cardiovascular death.

7.7.6.5 The fire department physician or other qualified medical evaluator shall compare baseline and subsequent stress tests, when available, to identify clinically relevant changes.

### 7.7.7 Mammography.

7.7.7.1 Mammography shall be performed annually on each female member over the age of 40.

7.7.7.2 A qualified radiologist shall compare mammograms to prior mammograms.

7.7.7.3 The fire department physician shall compare mammography reports to prior reports.

7.7.8 Immunizations and Infectious Disease Screening. The following infectious disease immunizations or infectious disease screenings shall be provided, as indicated:

- (1)\*Tuberculosis (TB) screening by either tuberculin skin testing using the tuberculin purified protein derivative (PPD) or the tuberculin blood test (interferon gamma release assay) shall be performed at baseline. Subsequent tuberculosis screening shall be performed annually or at a frequency according to CDC guidelines unless the member has a history of positive tuberculin screening test, in which case CDC guidelines for management and subsequent chest radiographic surveillance shall be followed
- (2) Hepatitis C virus screen — baseline and following occupational exposure
- (3) Hepatitis B virus vaccinations and titers — as specified in CDC guidelines
- (4) Tetanus/diphtheria vaccine — booster every 10 years
- (5) Measles, mumps, rubella vaccine (MMR) — one dose of MMR vaccine to members born after 1957 without prior immunization and/or evidence of immunity as outlined in the *Morbidity and Mortality Weekly Report* article “Measles, Mumps, and Rubella — Vaccine Use and Strategies for Elimination of Measles, Rubella, and Congenital Rubella Syndrome and Control of Mumps: Recommendations of the Advisory Committee on Immunization Practices (ACIP).”

(6) Polio vaccine — A single booster of IPV for members traveling to endemic areas in the line of duty, or as outlined in the *Morbidity and Mortality Weekly Report* article “Poliomyelitis Prevention in the United States: Updated Recommendations of the Advisory Committee on Immunization Practices (ACIP).”

(7) Hepatitis A vaccine

(8) Varicella vaccine — offered to all non-immune personnel

(9) Influenza vaccine (seasonal and novel) — offered to all personnel annually

(10) HIV screening — available to all personnel

7.7.8.1 Pre-screening and immunization against biological threat agents shall be made available to members following CDC guidelines or recommendations.

7.7.8.2 \* All members shall be immunized against infectious diseases as required by the AHJ and by 29 CFR 1910.1030, “Bloodborne pathogens.”

7.7.8.3 The fire department physician shall ensure that all members are offered currently recommended immunizations.

### 7.7.9 Post-Exposure Bloodborne Pathogen Testing.

7.7.9.1 Physicians who care for members shall follow current CDC recommendations for post-exposure prophylaxis (PEP) for bloodborne pathogen (BBP) exposures.

7.7.9.2 \* There shall be a written protocol for members who present with BBP exposures.

7.7.10 HIV Testing. HIV testing shall be offered on a confidential basis as part of post-exposure protocols and as requested by the fire department physician or member.

7.7.10.1 All results from HIV tests shall be provided directly to the member and shall be maintained by the physician as confidential documents.

7.7.10.2 Results from HIV tests shall not be forwarded to any local, state, provincial, national, or international authorities or databases unless mandated by public health statutes.

### 7.7.11 Heavy Metal Evaluation.

7.7.11.1 Baseline testing for heavy metals shall be required when indicated by known exposure or substantial risk.

7.7.11.2 Evaluations shall be performed following known exposures, for recurrent exposures, or where required under federal, state, or provincial regulations.

### 7.7.12 Colon Cancer Screening.

7.7.12.1 Fecal occult blood testing shall be provided annually to all members above the age of 40 or earlier if clinically indicated.

7.7.12.2 Colonoscopy services shall be recommended to all members above the age of 40 or earlier if clinically indicated and repeated at regular intervals.

7.7.13\* Prostate Cancer. Due to increased cancer risk, the fire department shall provide all male fire fighters with prostate-specific antigen (PSA) testing beginning at age 50 and annually thereafter. Those with a family history or African-American heritage, who are at a higher risk for prostate cancer, shall be provided with testing beginning at age 40 and annually thereafter.



## Chapter 8 Annual Occupational Fitness Evaluation of Members

### 8.1 Weight and Body Composition.

8.1.1\* Body weight shall be measured and recorded annually.

8.1.2 A body composition evaluation including the following shall be conducted on personnel solely for the purpose of departmental health surveillance:

- (1)\*Circumferential measurements
- (2) Hydrostatic weighing or Bod-Pod
- (3)\*Skinfold measurements
- (4) Bioimpedance analysis

### 8.2 Annual Fitness Evaluation.

8.2.1 A mandatory fitness evaluation that is not punitive or competitive shall be conducted annually as part of an individualized program.

8.2.1.1 All component results of the mandatory fitness evaluation shall be used to establish an individual's baseline or measured against the individual's previous assessments and not against any standard or norm.

8.2.2 The mandatory fitness evaluation shall include a mandatory pre-evaluation procedure and the components in 8.2.2.1 through 8.2.2.4. *(For additional information, see Annex C.)*

8.2.2.1\* An evaluation of aerobic capacity shall be performed after appropriate medical evaluation.

8.2.2.1.1 Testing shall be conducted using an appropriate maximal or submaximal protocol *(see C.2.1 and C.2.1.1)*. Bicycle ergometry is not appropriate because it underestimates true aerobic capacity and is not work-task specific.

8.2.2.1.2 \* At levels below 12 METs, a firefighter shall be coun- seled to improve his/her fitness.

8.2.2.1.3 At levels at or below 8 METs, a prescribed aerobic fitness program shall be required, and the AHJ shall be advised to consider restriction from essential job tasks 1, 2, 4, 5, 6, 7, 8, 9, and 13.

8.2.2.2 An evaluation of muscular strength shall be conducted using each of the following protocols:

- (1) Grip strength evaluation *(See C.2.1.5 for the protocol.)*
- (2) Leg strength evaluation *(See C.2.1.6 for the protocol.)*
- (3) Arm strength evaluation *(See C.2.1.7 for the protocol.)*

8.2.2.3 An evaluation of muscular endurance shall be conducted using each of the following protocols:

- (1) Push-up evaluation *(See C.2.1.9 for the protocol.)*
- (2) Curl-up evaluation *(See C.2.1.11 for the protocol.)*

8.2.2.4 An evaluation of flexibility shall be conducted using the sit-and-reach protocol. *(See C.2.1.12 for the protocol.)*

## Chapter 9 Essential Job Tasks — Specific Evaluation of Medical Conditions in Members

### 9.1 Essential Job Tasks.

9.1.1 The essential job tasks listed by number in this chapter are the same as those listed in Chapter 5 and shall be validated by the fire department as required by Chapter 5.

9.1.2 The fire department physician shall use the validated list of essential job tasks in evaluating the ability of a member with specific medical conditions to perform specific job tasks.

9.1.3 Essential job tasks referenced throughout this chapter by number only shall correspond to the following model list:

- (1)\*Wearing personal protective ensemble and SCBA, performing fire-fighting tasks (hoseline operations, extensive crawling, lifting and carrying heavy objects, ventilating roofs or walls using power or hand tools, forcible entry, etc.), rescue operations, and other emergency response actions under stressful conditions, including working in extremely hot or cold environments for prolonged time periods
- (2) Wearing an SCBA, which includes a demand valve-type positive-pressure facepiece or HEPA filter masks, which requires the ability to tolerate increased respiratory workloads
- (3) Exposure to toxic fumes, irritants, particulates, biological (infectious) and nonbiological hazards, and/or heated gases, despite the use of personal protective ensembles and SCBA
- (4) Depending on the local jurisdiction, climbing six or more flights of stairs while wearing fire protective ensemble weighing at least 50 lb (22.6 kg) or more and carrying equipment/tools weighing an additional 20 to 40 lb (9 to 18 kg)
- (5) Wearing fire protective ensemble that is encapsulating and insulated, which will result in significant fluid loss that frequently progresses to clinical dehydration and can elevate core temperature to levels exceeding 102.2°F (39°C)
- (6) Wearing personal protective ensemble and SCBA, searching, finding, and rescue-dragging or carrying victims ranging from newborns to adults weighing over 200 lb (90 kg) to safety despite hazardous conditions and low visibility
- (7) Wearing personal protective ensemble and SCBA, advancing water-filled hoselines up to 2½ in. (65 mm) in diameter from fire apparatus to occupancy [approximately 150 ft (50 m)], which can involve negotiating multiple flights of stairs, ladders, and other obstacles
- (8) Wearing personal protective ensemble and SCBA, climbing ladders, operating from heights, walking or crawling in the dark along narrow and uneven surfaces, and operating in proximity to electrical power lines and/or other hazards
- (9) Unpredictable emergency requirements for prolonged periods of extreme physical exertion without benefit of warm-up, scheduled rest periods, meals, access to medication(s), or hydration
- (10) Operating fire apparatus or other vehicles in an emergency mode with emergency lights and sirens
- (11) Critical, time-sensitive, complex problem solving during physical exertion in stressful, hazardous environments, including hot, dark, tightly enclosed spaces, that is further aggravated by fatigue, flashing lights, sirens, and other distractions
- (12) Ability to communicate (give and comprehend verbal orders) while wearing personal protective ensembles and SCBA under conditions of high background noise, poor visibility, and drenching from hoselines and/or fixed protection systems (sprinklers)
- (13) Functioning as an integral component of a team, where sudden incapacitation of a member can result in mission failure or in risk of injury or death to civilians or other team members



## 9.2 Special Teams.

**9.2.1** In addition to essential job tasks specified in 9.1.3(1) through 9.1.3(13), members of specialized teams such as hazardous materials units, SCUBA teams, technical rescue teams, EMS teams, or units supporting tactical law enforcement operations shall be evaluated for their ability to perform essential job tasks and wear specialized PPE related to the duties of those specialized teams.

**9.2.2** The fire department shall define those essential job tasks and shall provide the fire department physician with a description of the risks associated with those tasks and specialized PPE as well as any additional medical and/or physical requirements that are not enumerated in this standard.

**9.2.3** In defining those tasks, the fire department shall consider the impact on the members required to wear or utilize specialized PPE that can increase weight, environmental isolation, sensory deprivation, and/or dehydration potential above levels experienced with standard fire suppression PPE.

**9.3 Fire Department Physician Roles.** After individually evaluating the member and the member's medical records (including job-related medical rehabilitation records), the fire department physician shall recommend restricting members from performing only those specific job tasks that cannot be safely performed by the member given his/her medical condition.

**9.3.1** If an illness, injury, or other debilitating condition has altered a member's ability to safely perform an essential job task, the fire department physician shall notify the fire department that the member is restricted from performing that task while on duty.

**9.3.2** \* The fire department shall determine possible accommodations for members restricted from certain job tasks.

**9.3.3** \* For incumbent fire department members, conditions listed in Chapter 9 shall not indicate a blanket prohibition for such incumbent members from continuing to perform the essential job tasks, nor shall they require automatic retirement or separation from the fire department.

**9.3.4** After an individual medical assessment, the physician shall state whether the member, due to a specific condition, can or cannot safely perform his or her essential job tasks.

**9.3.5** The AHJ shall determine if the individual can remain in his/her current position or be moved to another position that the individual can perform.

## 9.4\* Cardiovascular Disorders.

**9.4.1** Cardiovascular disorders shall include any disorder of the cardiovascular system including but not limited to supraventricular or ventricular arrhythmias (abnormal heart beats), coronary artery disease, and cardiac muscle disease or valve disease.

**9.4.2** If the member has any cardiovascular disorders, the member shall be individually evaluated in accordance with 9.4.3 through 9.4.23 to determine if the disorders compromise the member's ability to safely perform the essential job tasks.

### 9.4.3 Coronary Artery Disease.

**9.4.3.1 Physician Evaluation.** The following clinical conditions referable to coronary artery disease including history of myocardial infarction, coronary artery bypass surgery, coronary angioplasty with stent placement, or similar procedures compromise the member's ability to safely perform essential job tasks 1, 2, 4, 5, 6, 7, 9, and 13, and the physician shall report the applicable job

limitations to the fire department if any one of the following are present:

- (1) Current angina pectoris even if relieved by medication
- (2) Persistent significant stenosis in any coronary artery (greater than 70 percent lumen diameter narrowing) following treatment
- (3) Lower than normal left ventricular ejection fraction as measured by radionuclide scan, contrast ventriculography, or echocardiography
- (4) Maximal exercise tolerance of less than 12 METs
- (5) Exercise-induced ischemia or ventricular arrhythmias observed by radionuclide stress test during an evaluation reaching a workload of at least 12 METs
- (6) History of myocardial infarction, angina, or coronary artery disease with persistence of modifiable risk factor(s) for acute coronary plaque rupture (e.g., tobacco use, hypertension despite treatment or hypercholesterolemia with cholesterol greater than or equal to 180 or low density lipoproteins greater than or equal to 100 despite treatment, or glycosylated hemoglobin greater than 7 despite exercise and/or weight reduction)

**9.4.3.2 Physician Guidance.** The physician shall consider the following when evaluating a member:

- (1) Evaluation of coronary artery disease requires a stress test with imaging and/or coronary angiogram and some assessment of left ventricular function. Following a myocardial infarction or a coronary revascularization procedure, a radionuclide stress test shall be performed to evaluate exercise tolerance and the presence of exercise-induced myocardial ischemia or ventricular arrhythmias.
- (2) Reports of left ventricular ejection fraction for evaluation of 9.4.3.1(3) should include "normal" values for the lab performing the test and formal interpretation by a cardiologist.
- (3) Workload demands of fire fighting have been shown to exceed the levels shown in 9.4.3.1(4).

### 9.4.4 Congestive Heart Failure.

**9.4.4.1 Physician Evaluation.** Congestive heart failure due to any etiology including any disease leading to a lower than normal left or right ventricular ejection fraction, even if corrected by medication, compromises the member's ability to safely perform essential job tasks 1, 2, 4, 7, 9, and 13, and the physician shall report the applicable job limitations to the fire department.

**9.4.4.2 Physician Guidance.** The physician shall consider that if the heart failure is due to a reversible process that ultimately results in no abnormality in cardiac performance off all cardiac medications (e.g., hyperthyroidism, anemia), then a history of congestive heart failure does not permanently prevent a member from safely performing the essential job tasks.

### 9.4.5 Restrictive Cardiomyopathy and Constrictive Pericarditis.

**9.4.5.1 Physician Evaluation.** Restrictive cardiomyopathy and constrictive pericarditis when resulting in heart failure compromise the member's ability to safely perform essential job tasks 1, 2, 4, 7, and 9, and the physician shall report the applicable job limitations to the fire department.

### 9.4.6 Acute Pericarditis, Acute Endocarditis, and Acute Myocarditis.

**9.4.6.1 Physician Evaluation.** Acute pericarditis, acute endocarditis, and acute myocarditis compromise the member's ability to safely perform essential job tasks 1, 4, 5, 6, 7, 9, and



13, and the physician shall report the applicable job limitations to the fire department.

#### 9.4.7 Pericarditis, Endocarditis, or Myocarditis.

**9.4.7.1 Physician Evaluation.** Chronic pericarditis, endocarditis, or myocarditis when resulting in heart failure or significant valvular incompetence or arrhythmias compromises the member's ability to safely perform essential job tasks 1, 4, 5, 6, 7, and 13, and the physician shall report the applicable job limitations to the fire department.

**9.4.7.2 Physician Guidance.** Members with pericarditis, endocarditis, or myocarditis shall be carefully assessed for cardiac function, rhythm, and valvular competence at least annually by cardiac echo or other noninvasive or invasive monitoring in consultation with a cardiologist.

#### 9.4.8 Hypertrophic Obstructive Cardiomyopathy.

**9.4.8.1 Physician Evaluation.** Hypertrophic obstructive cardiomyopathy (HCM) (idiopathic hypertrophic subaortic stenosis) compromises the member's ability to safely perform essential job tasks 1 and 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.4.8.2 Physician Guidance.** HCM is associated with life-threatening arrhythmias and sudden cardiac death without previous symptoms of heart failure. In specific populations of patients with cardiomyopathies under normal environmental conditions, the following risk factors for sudden cardiac death shall be considered by the physician:

- (1) Family history of a premature HCM-related sudden death (in a first-degree relative)
- (2) Unexplained syncope
- (3) History of cardiac arrest
- (4) Sustained ventricular tachycardia (VT)
- (5) Nonsustained VT (3 beats or more of at least 120 beats/minute documented on a Holter monitor)
- (6) Left ventricle thickness of 30 mm on echocardiogram
- (7)\*Abnormal blood pressures during the exercise stress test (EST) (peak systolic BP less than 110 mm Hg or a rise less than 30 mm Hg from baseline)

#### 9.4.9 Recurrent Syncope.

**9.4.9.1\* Physician Evaluation.** Recurrent syncope compromises the member's ability to safely perform essential job task 13, and the physician shall report the applicable job limitations to the fire department.

#### 9.4.10 Pacemaker or Automatic Implantable Defibrillator.

**9.4.10.1\* Physician Evaluation.** A medical condition requiring a pacemaker or automatic implantable defibrillator compromises the member's ability to safely perform essential job task 13, and the physician shall report the applicable job limitations to the fire department.

#### 9.4.11 Mitral Valve Stenosis.

**9.4.11.1 Physician Evaluation.** Moderate to severe mitral valve stenosis defined as valve area less than or equal to 1.5 cm<sup>2</sup> or pulmonary artery systolic pressure greater than 35 mm Hg compromises the member's ability to safely perform essential job tasks 1, 4, 5, 7, and 9, and the physician shall report the applicable job limitations to the fire department.

#### 9.4.12 Mitral Valve Insufficiency.

**9.4.12.1 Physician Evaluation.** Moderate to severe mitral valve insufficiency, defined as the presence of left ventricular dysfunction, compromises the member's ability to safely perform essential job tasks 1, 4, 5, 7, and 9, and the physician shall report the applicable job limitations to the fire department.

**9.4.12.2 Physician Guidance.** Mitral valve prolapse only interferes with safe performance of critical job tasks if associated with arrhythmias or if moderate to severe mitral regurgitation is present.

#### 9.4.13 Aortic Valve Stenosis.

**9.4.13.1 Physician Evaluation.** Moderate to severe aortic valve stenosis defined as mean aortic valvular gradient greater than or equal to 20 mm Hg and/or valve area less than or equal to 1.0 cm<sup>2</sup> compromises the member's ability to safely perform essential job tasks 1, 4, 5, 6, 7, 9, and 13, and the physician shall report the applicable job limitations to the fire department.

#### 9.4.14 Aortic Valve Insufficiency.

**9.4.14.1 Physician Evaluation.** Moderate to severe aortic valve insufficiency when the cause of left ventricular dysfunction compromises the member's ability to safely perform essential job tasks 1, 4, 7, and 9, and the physician shall report the applicable job limitations to the fire department.

#### 9.4.15 Prosthetic Cardiac Valves.

**9.4.15.1 Physician Evaluation.** Prosthetic cardiac valves compromise the member's ability to safely perform essential job task 8 if anticoagulation is required and essential job tasks 1, 4, 6, 7, and 9 if left ventricular dysfunction is present, and the physician shall report the applicable job limitations to the fire department.

#### 9.4.16 Wolff-Parkinson-White (WPW) Syndrome.

**9.4.16.1\* Physician Evaluation.** Wolff-Parkinson-White (WPW) syndrome with a history of supraventricular tachycardia (SVT) compromises the member's ability to safely perform essential job task 13, and the physician shall report the applicable job limitations to the fire department.

#### 9.4.17 Other Supraventricular Arrhythmias, Atrial Fibrillation, or Atrial Flutter.

**9.4.17.1\* Physician Evaluation.** Other supraventricular arrhythmias, atrial fibrillation, or atrial flutter when persistent (even if rate controlled) or if anticoagulation is required compromise the member's ability to safely perform essential job task 13 and essential job task 8 if anticoagulation is required, and the physician shall report the applicable job limitations to the fire department.

**9.4.17.2 Physician Guidance.** The physician shall consider that if the atrial fibrillation is recurrent but self-limited off cardiac medications, there is no evidence of ischemia, and the echocardiogram reveals both a normal mitral valve and a normal-sized left atrium, then the member might be able to safely perform full duties. Paroxysmal atrial tachycardia can sometimes be resolved with modification of diet or treatment of other underlying non-cardiac conditions.

#### 9.4.18 Ventricular Arrhythmias and Ectopy.

##### 9.4.18.1 Physician Evaluation.

**9.4.18.1.1** The physician shall evaluate the member to determine if a history of ventricular arrhythmias (e.g., ventricular



tachycardia and ventricular fibrillation) compromises the member's ability to safely perform essential job task 13, and the physician shall report the applicable job limitations to the fire department.

**9.4.18.1.2** A history of ventricular ectopy might compromise the member's ability to safely perform essential job task 13, and after evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.4.18.2 Physician Guidance.** The physician shall consider the following:

- (1) A history of ventricular arrhythmias, including ventricular tachycardia or ventricular fibrillation, poses significant risk for life-threatening sudden incapacitation in the presence of structural abnormalities, functional abnormalities, or ectopy that occurs during exercise.
- (2) A history of ventricular ectopy might pose a significant risk for life-threatening sudden incapacitation if structural or ischemic heart disease is present or if ventricular ectopy increases during exercise.
- (3) Holter monitoring (24-hour ECG recording) might show ventricular ectopy but should show no evidence of ventricular arrhythmias.
- (4) Echocardiograph must show normal function and no evidence of structural abnormalities.
- (5) Stress testing off cardiac medications must show no evidence for ischemia, ventricular tachycardia, or ventricular fibrillation.
- (6) Premature ventricular contractions (PVCs) should resolve with increasing levels of exercise up to 12 METs.

#### **9.4.19 Atrioventricular Block.**

##### **9.4.19.1 Physician Evaluation.**

**9.4.19.1.1** Third-degree or complete atrioventricular block compromises the member's ability to safely perform essential job task 13, and the physician shall report the applicable job limitations to the fire department.

**9.4.19.1.2** Other types of atrioventricular block with sinus pause greater than 3 seconds, left bundle branch block, right bundle branch block, or second-degree Type I atrioventricular block might compromise the member's ability to safely perform job task 13 if cardiac structural (i.e., coronary arteries, valves, myocardium) abnormalities are present, if left ventricular function is abnormal, or if heart rate does not increase with exercise in the absence of a mechanical pacemaker, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

##### **9.4.20 Hypertension.**

**9.4.20.1\* Physician Evaluation.** Members with stage I hypertension shall be referred to their primary care physician to ensure that their blood pressure is controlled and to consider periodic screening for asymptomatic end organ damage based on the severity and duration of their hypertension.

**9.4.20.2** Members with Stage 2 hypertension (systolic greater than or equal to 160 mm Hg or diastolic greater than or equal to 100 mm Hg) or any member with end organ damage (retinopathy, nephropathy, or vascular or cardiac complications) compromises the member's ability to safely perform essential job tasks 1, 5, 7, 9, and 13, and the physician shall report the applicable job limitations to the fire department.

#### **9.4.21 Metabolic Syndrome.**

**9.4.21.1\*** Members with metabolic syndrome are at increased risk for cardiovascular ischemic disease, diabetes, and accelerated hypertension and shall undergo a stress test with imaging; if the results are abnormal or the member is unable to achieve an aerobic capacity of 12 METs, the member's ability to safely perform essential job tasks 1, 2, 4, 5, 6, 7, 8, 9, 10, and 13 will be compromised.

#### **9.4.22 Cardiac Congenital Abnormality.**

**9.4.22.1 Physician Evaluation.** A history of a cardiac congenital abnormality that has been treated by surgery but with residual complications or that has not been treated by surgery, leaving residuals or complications, might compromise the member's ability to safely perform essential job tasks 1, 4, 5, 6, 7, 9, and 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.4.23 Cardiac Hypertrophy.**

**9.4.23.1 Physician Evaluation.** Cardiac hypertrophy when not a normal response to exercise of the heart might compromise the member's ability to safely perform essential job task 13 and other job functions due to limitations of endurance, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.4.23.2 Physician Guidance.** The physician shall consider that this condition can result in the potential for sudden incapacitation.

#### **9.4.24 Heart Transplant.**

**9.4.24.1 Physician Evaluation.** Cardiac transplantation prevents a normal rise in heart rate and increases risk of syncope and sudden cardiac death and therefore shall be considered as compromising the member's ability to safely perform essential job tasks 1, 2, 4, 5, 6, 7, 8, 9, 10, and 13.

**9.4.24.2 Physician Guidance.** The physician shall consider that this condition can result in the potential for sudden incapacitation and that the many immunosuppressive drugs required to prevent rejection increase the likelihood for infection.

#### **9.5 Vascular Disorders.**

**9.5.1** Vascular disorders shall refer to any disorder of the vascular (arterial or venous) system including but not limited to aneurysm, peripheral vascular insufficiency, and thromboembolic disease.

**9.5.2** If the member has any vascular disorders, the member shall be individually evaluated in accordance with 9.5.3 through 9.5.11 to determine if the disorders compromise the member's ability to safely perform the essential job tasks, recognizing that heart rate, blood pressure, and shear forces on vessel walls are increased when performing many of the essential job tasks, increasing the risk of acute dissection, rupture, and/or embolic phenomena that even in a normal environment can result in life-threatening sudden incapacitation.

##### **9.5.3 Aortic Aneurysm.**

**9.5.3.1 Physician Evaluation.** Aortic aneurysm (thoracic aortic aneurysm of any size or abdominal aortic aneurysm greater than or equal to 4 cm) compromises the member's ability to safely perform essential job tasks 1, 4, 6, 7, and 13, and the

physician shall report the applicable job limitations to the fire department.

**9.5.3.2 Physician Guidance.** When evaluating a member with an abdominal aortic aneurysm less than 4 cm, the physician shall recognize that treatment requires careful control of blood pressure and regular follow-up with cardiac imaging.

**9.5.3.2.1** A minimum of 6 months post-surgical repair of any aortic aneurysm shall be required before the member can be evaluated for return-to-duty status.

#### **9.5.4 Carotid Artery Disease.**

**9.5.4.1 Physician Evaluation.** Carotid artery disease when symptomatic and/or reduction in blood flow of greater than 70 percent is present compromises the member's ability to safely perform job task 13, and the physician shall report the applicable job limitations to the fire department.

#### **9.5.5 Thoracic Outlet Syndrome.**

**9.5.5.1 Physician Evaluation.** Thoracic outlet syndrome (symptomatic) compromises the member's ability to safely perform essential job tasks 1 and 13, and the physician shall report the applicable job limitations to the fire department.

#### **9.5.6 Peripheral Vascular Disease.**

**9.5.6.1 Physician Evaluation.** Peripheral vascular disease (arterial or venous) when symptomatic (claudication) or severe peripheral edema is present compromises the member's ability to safely perform essential job tasks 1, 4, 5, 7, and 9, and the physician shall report the applicable job limitations to the fire department.

#### **9.5.7 Thrombophlebitis.**

##### **9.5.7.1 Physician Evaluation.**

**9.5.7.1.1** Thrombophlebitis or deep venous thrombosis that is recurrent or persistent or requires anticoagulation compromises the member's ability to safely perform essential job tasks 1, 4, 5, 7, and 9, and the physician shall report the applicable job limitations to the fire department.

**9.5.7.1.2** Full-dose or low-dose anticoagulation compromises the member's ability to safely perform essential job task 8, and the physician shall report the applicable job limitations to the fire department.

#### **9.5.8 Circulatory Instability.**

**9.5.8.1 Physician Evaluation.** Circulatory instability as indicated by orthostatic hypotension or persistent tachycardia compromises the member's ability to safely perform essential job tasks 1, 5, 9, and 13, and the physician shall report the applicable job limitations to the fire department.

#### **9.5.9 Peripheral Vascular Disease.**

**9.5.9.1 Physician Evaluation.** Peripheral vascular disease, such as severe Raynaud's phenomenon, might compromise the member's ability to safely perform essential job tasks (e.g., under certain conditions, including cold weather), and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.5.10 Lymphedema.**

**9.5.10.1 Physician Evaluation.** Chronic, severe lymphedema or massive edema of any type (e.g., due to lymphadenopathy, severe venous valvular incompetency, endocrine abnormali-

ties, or low flow states) compromises the member's ability to safely perform essential job tasks 1, 4, 5, and 8, and the physician shall report the applicable job limitations to the fire department.

#### **9.5.11 Lesions of Aorta or Major Vessels.**

##### **9.5.11.1 Physician Evaluation.**

**9.5.11.1.1** Congenital or acquired lesions of the aorta or major blood vessels might interfere with circulation and prevent the safe performance of essential job tasks 1, 4, and 7 due to limitations of endurance, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.5.11.1.2** Congenital or acquired lesions of the aorta or major blood vessels could increase the potential for life-threatening sudden incapacitation, which might compromise the member's ability to safely perform essential job task 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.6\* Endocrine and Metabolic Disorders.**

**9.6.1** Endocrine and metabolic disorders shall include disorders of the hypothalamic-pituitary-thyroid-adrenal axis.

**9.6.2** If the member has any endocrine and metabolic disorders, the member shall be individually evaluated in accordance with 9.6.3 through 9.6.7 to determine if the disorders compromise the member's ability to safely perform the essential job tasks.

#### **9.6.3 Type 1 Diabetes Mellitus That Requires Treatment with Insulin.**

**9.6.3.1\* Physician Evaluation.** Type 1 diabetes mellitus that requires treatment with insulin compromises the member's ability to safely perform essential job tasks 5, 9, and 13, and the physician shall report the applicable job limitations to the fire department, unless the member meets all of the following criteria:

- (1) Is maintained by a physician knowledgeable in current management of diabetes mellitus on a basal/bolus (can include subcutaneous insulin infusion pump) regimen using insulin analogs.
- (2) Has demonstrated over a period of at least 6 months the motivation and understanding required to closely monitor and control capillary blood glucose levels through nutritional therapy and insulin administration. Assessment of this shall take into consideration the member's experience and history dealing with erratic meal schedules, sleep disruption, and high aerobic and anaerobic workloads intrinsic to fire fighting.
- (3) Has a dilated retinal exam by a qualified ophthalmologist or optometrist that shows no higher grade of diabetic retinopathy than microaneurysms, as indicated on the International Clinical Diabetic Retinopathy Disease Severity Scale.
- (4) Has normal renal function based on a calculated creatinine clearance greater than 60 mL/min and absence of proteinuria. (Creatinine clearance can be calculated by use of the Cockcroft-Gault or similar formula. Proteinuria is defined as 24-hour urine excretion of greater than or equal to 300 mg protein or greater than or equal to 300 mg of albumin per gram of creatinine in a random sample.)
- (5) Has no autonomic or peripheral neuropathy. (Peripheral neuropathy is determined by diminished ability to feel





the vibration of a 128 cps tuning fork or the light touch of a 10-gram monofilament on the dorsum of the great toe proximal to the nail. Autonomic neuropathy can be determined by evidence of gastroparesis, postural hypotension, or abnormal tests of heart rate variability.)

- (6) Has normal cardiac function without evidence of myocardial ischemia on cardiac stress testing (to at least 12 METs) by ECG and cardiac imaging.
- (7) Has a signed statement and medical records from an endocrinologist or a physician with demonstrated knowledge in the current management of diabetes mellitus as well as knowledge of the essential job tasks and hazards of fire fighting as described in 9.1, allowing the fire department physician to determine whether the member meets the following criteria:
  - (a) Is maintained on a stable basal/bolus regimen using insulin analogs and has demonstrated over a period of at least 6 months the motivation and understanding required to closely monitor and control capillary blood glucose levels through nutritional therapy and insulin administration despite varied activity schedules.
  - (b) Has had hemoglobin A1C measured at least four times a year (intervals of two to three months) over the last 12 months prior to evaluation if the diagnosis of diabetes has been present over 1 year. Hemoglobin A1C reading of 8 percent or greater shall trigger a medical evaluation to determine if a condition exists in addition to diabetes that is responsible for the hemoglobin A1C not accurately reflecting average glucose levels, including evidence of a set schedule for blood glucose monitoring and a thorough review of data from such monitoring.
  - (c) Does not have an increased risk of hypoglycemia due to alcohol use or other predisposing factors.
  - (d) Has had no episodes of severe hypoglycemia (defined as requiring assistance of another) in the preceding 1 year, with no more than two episodes of severe hypoglycemia in the preceding 3 years.
  - (e) Is certified not to have a medical contraindication to fire-fighting training and operations.

**9.6.3.2 Physician Guidance.** When evaluating a member with Type 1 diabetes mellitus, the physician shall recognize that episodes of severe hypoglycemia are associated with an increased risk of subsequent episodes and that hypoglycemia can interfere with cognitive function and judgment. Presence of microvascular and neurological complications of diabetes might increase the risk of hypoglycemic events.

#### **9.6.4 Type 2 Diabetes Mellitus That Requires Treatment with Insulin.**

**9.6.4.1\* Physician Evaluation.** Type 2 diabetes mellitus that requires treatment with insulin compromises the member's ability to safely perform essential job tasks 5, 9, and 13, and the physician shall report the applicable job limitations to the fire department, unless the member meets all of the following criteria:

- (1) Is maintained by a physician knowledgeable in current management of diabetes mellitus.
- (2) Has demonstrated over a period of at least 3 months the motivation and understanding required to closely monitor and control capillary blood glucose levels through nutritional therapy and insulin administration. Assessment

of this shall take into consideration the member's experience and prior history dealing with the erratic meal schedules, sleep disruption, and high aerobic and anaerobic workloads intrinsic to fire fighting.

- (3) Has a dilated retinal exam by a qualified ophthalmologist or optometrist that shows no higher grade of diabetic retinopathy than microaneurysms, as indicated on the International Clinical Diabetic Retinopathy Disease Severity Scale.
- (4) Has normal renal function based on a calculated creatinine clearance greater than 60 mL/min and absence of proteinuria. (Creatinine clearance can be calculated by use of the Cockcroft-Gault or similar formula. Proteinuria is defined as 24-hour urine excretion of greater than or equal to 300 mg protein or greater than or equal to 300 mg of albumin per gram of creatinine in a random sample.)
- (5) Has no autonomic or peripheral neuropathy. (Peripheral neuropathy is determined by diminished ability to feel the vibration of a 128 cps tuning fork or the light touch of a 10-gram monofilament on the dorsum of the great toe proximal to the nail. Autonomic neuropathy can be determined by evidence of gastroparesis, postural hypotension, or abnormal tests of heart rate variability.)
- (6) Has normal cardiac function without evidence of myocardial ischemia on cardiac stress testing (to at least 12 METs) by ECG and cardiac imaging.
- (7) Has a signed statement and medical records from an endocrinologist or a physician with demonstrated knowledge in the current management of diabetes mellitus as well as knowledge of the essential job tasks and hazards of fire fighting as described in Section 9.1, allowing the fire department physician to determine whether the member meets the following criteria:
  - (a) Is maintained on a stable insulin regimen and has demonstrated over a period of at least 3 months the motivation and understanding required to closely monitor and control capillary blood glucose levels despite varied activity schedules through nutritional therapy and insulin administration.
  - (b) Has had hemoglobin A1C measured at least four times a year (intervals of 2 to 3 months) over the last 12 months prior to evaluation if the diagnosis of diabetes has been present over 1 year. Hemoglobin A1C reading of 8 percent or greater shall trigger a medical evaluation to determine if a condition exists in addition to diabetes that is responsible for the hemoglobin A1C not accurately reflecting average glucose levels, including evidence of a set schedule for blood glucose monitoring and a thorough review of data from such monitoring.
  - (c) Does not have an increased risk of hypoglycemia due to alcohol use or other predisposing factors.
  - (d) Has had no episodes of severe hypoglycemia (defined as requiring assistance of another) in the preceding 1 year, with no more than one episode of severe hypoglycemia in the preceding 5 years.
  - (e) Is certified not to have a medical contraindication to fire-fighting training and operations.

**9.6.4.2 Physician Guidance.** When evaluating a member with Type 2 diabetes mellitus, the physician shall recognize that episodes of severe hypoglycemia are considered the best predictors of an increased risk of subsequent episodes and hypoglycemia interferes with cognitive function and judgment.

### 9.6.5 Diabetes Mellitus That Does Not Require Insulin Therapy.

**9.6.5.1 Physician Evaluation.** Diabetes mellitus that does not require insulin therapy and that is controlled by diet, exercise, and/or oral hypoglycemic agents compromises the member's ability to safely perform essential job tasks 5, 9, and 13, and the physician shall report the applicable job limitations to the fire department, unless the member meets all of the following criteria:

- (1) Has had hemoglobin A1C measured at least four times a year (intervals of 2 to 3 months) over the last 12 months prior to evaluation if the diagnosis of diabetes has been present over 1 year. Hemoglobin A1C reading of 8 percent or greater shall trigger a medical evaluation to determine if a condition exists in addition to diabetes that is responsible for the hemoglobin A1C not accurately reflecting average glucose levels, shall including evidence of a set schedule for blood glucose monitoring and a thorough review of data from such monitoring.
- (2) If on oral hypoglycemic agents, has had no episodes of severe hypoglycemia (defined as requiring assistance of another in the preceding year).
- (3) Has a dilated retinal exam by a qualified ophthalmologist or optometrist that shows no higher grade of diabetic retinopathy than microaneurysms, as indicated on the International Clinical Diabetic Retinopathy Disease Severity Scale.
- (4) Has normal renal function based on a calculated creatinine clearance greater than 60 mL/min and absence of proteinuria. (Creatinine clearance can be calculated by use of the Cockcroft-Gault or similar formula. Proteinuria is defined as 24-hour urine excretion of greater than or equal to 300 mg protein or greater than or equal to 300 mg of albumin per gram of creatinine in a random sample.)
- (5) Has no autonomic or peripheral neuropathy. (Peripheral neuropathy is determined by diminished ability to feel the vibration of a 128 cps tuning fork or the light touch of a 10-gram monofilament on the dorsum of the great toe proximal to the nail. Autonomic neuropathy can be determined by evidence of gastroparesis, postural hypotension, or abnormal tests of heart rate variability.)
- (6) Has normal cardiac function without evidence of myocardial ischemia on cardiac stress testing (to at least 12 METs) by ECG and cardiac imaging.

### 9.6.6 Nutritional Deficiencies.

**9.6.6.1 Physician Evaluation.** Nutritional deficiencies, including those caused by congenital or acquired disorders of metabolism, might compromise the member's ability to safely perform essential job tasks 1, 5, and 9, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.6.6.2 Physician Guidance.** When evaluating a member with nutritional deficiencies, the physician shall perform an assessment of severity and functional impact and should include percent of ideal body weight, body mass index (BMI), muscle strength, endurance, energy levels, and abilities to feed, hydrate, and absorb essential nutrients pre- and post-fire activities.

### 9.6.7 Diseases of the Adrenal Gland, Pituitary Gland, Parathyroid Gland, or Thyroid Gland.

**9.6.7.1 Physician Evaluation.** Untreated or inadequately controlled diseases of the adrenal gland, pituitary gland, parathyroid gland, or thyroid gland of clinical significance compro-

mise the member's ability to safely perform essential job tasks 1, 5, and 9, and the physician shall report the applicable job limitations to the fire department.

**9.6.7.2 Physician Guidance.** When evaluating a member, the physician shall recognize that clinically controlled diseases of the adrenal gland, pituitary gland, parathyroid gland, or thyroid gland with normal exam and serum levels do not compromise the member's ability to safely perform essential job tasks.

### 9.7\* Lung, Chest Wall, and Respiratory Disorders.

**9.7.1 Lung, chest wall, and respiratory disorders** shall include disorders of breathing and the exchange of respiratory gases (oxygen and carbon dioxide), central neurologic control of respiratory drive, nose, sinuses, throat, pharynx, larynx, trachea, airways, lungs, pleura, and chest wall.

**9.7.2** When evaluating a member for lung, chest wall, and respiratory disorders, the physician shall consider the following:

- (1) Efficient breathing and respiratory gas exchange is required for essential job tasks 1, 2, 3, 4, 5, 7, 9, and 13.
- (2) Wearing protective clothing increases the oxygen consumption required to safely perform these tasks and, therefore, increases the respiratory workload.
- (3) SCBA is a positive-pressure demand valve respirator that provides a barrier against the inhalation of noxious/toxic gases and particulate matter but at increased metabolic cost due to its weight and increased respiratory workload (resistance and dead space).
- (4) If respiratory function or gas exchange is already compromised (increased work of breathing from structural or functional abnormalities, hypoxia, and/or hypercapnia) prior to the performance of essential job tasks, then the increased oxygen demand of strenuous physical exertion, while wearing a personal protective ensemble and/or SCBA, leads to early onset of fatigue or respiratory insufficiency.
- (5) Lung, chest wall, and respiratory disorders can compromise the member's ability to safely perform essential job tasks 1, 2, 3, 4, 5, 7, 9, and 13.

**9.7.3** If the member has any lung, chest wall, or respiratory disorders, the member shall be individually evaluated in accordance with 9.7.4 through 9.7.24 to determine if the disorders compromise the member's ability to safely perform the essential job tasks.

### 9.7.4 Tracheostomy.

**9.7.4.1 Physician Evaluation.** Tracheostomy compromises the member's ability to safely wear SCBA (essential job task 2), communicate effectively due to oropharyngeal dysfunction (essential job task 12), and effectively clear secretions or inhaled particulate matter (essential job task 3), and the physician shall report the applicable job limitations to the fire department.

**9.7.4.2 Physician Guidance.** The physician shall consider that a member with a history of tracheostomy that is now sealed and without persistent respiratory disease or dysfunction does not prevent safe performance of essential job tasks.

### 9.7.5 Chronic Cough.

**9.7.5.1 Physician Evaluation.** Chronic cough with or without hemoptysis might compromise the member's ability to safely wear SCBA (essential job task 2) and to safely perform in an irritant environment (essential job task 3), and after further evaluation and a final medical determination of the member's



condition, the physician shall report any applicable job limitations to the fire department.

**9.7.5.2 Physician Guidance.** The physician shall consider the severity of the cough, the impact of irritants and SCBA use on cough severity, and the impact of cough severity on the ability to safely wear SCBA and perform strenuous exertion. The cause of chronic cough and/or hemoptysis needs to be evaluated, as the underlying conditions can also produce increased work of breathing, gas exchange abnormalities, or airway hyperreactivity.

#### 9.7.6\* Asthma.

**9.7.6.1 Physician Evaluation.** Asthma compromises the member's ability to safely perform essential job tasks 1, 2, 3, 4, 5, 7, 9, and 13, and the physician shall report the applicable job limitations to the fire department, unless the following provisions are met:

- (1) The member denies bronchospasm during exertion, temperature/humidity extremes, irritant exposures, fire activities, or hazmat activities.
- (2) The member denies the use of bronchodilator rescue medications during exertion, temperature/humidity extremes, irritant exposures, fire activities, or hazmat activities.
- (3) A review of the member's fire department records (training, operations, rehabilitation, and medical) verifies that no asthmatic episodes have occurred during fire suppression or hazardous materials operations or training.
- (4) As defined by the National Heart Lung and Blood Institute's *Guidelines for the Diagnosis and Management of Asthma*, the member has mild asthma classified as either "Step One" (no control medications and requires inhaled bronchodilator rescue medications for attacks no more than two times per week) or "Step Two" (daily control medications consisting of low-dose inhaled corticosteroids or cromolyn or oral leukotriene receptor antagonists (e.g., Montelukast) and requires inhaled bronchodilator rescue medications for attacks no more than two times per week).
- (5) The member's asthma has not required systemic corticosteroids, emergency room treatment, or hospital admission in the last 2 years.
- (6) The member shows adequate reserve in pulmonary function (FVC and FEV<sub>1</sub> greater than or equal to 90 percent) and no bronchodilator response measured off all bronchodilators on the day of testing.
- (7)\*The member has a normal or negative response (less than 20 percent decline in FEV<sub>1</sub>) from baseline to provocative challenge testing using cold air, methacholine (PC<sub>20</sub> greater than 8 is considered normal, as response at dose greater than 8 mg might not be clinically significant), histamine, mannitol, or exercise. For exercise challenge testing, a normal response is a decline in FEV<sub>1</sub> less than 13 percent from baseline.
- (8) The fire department provides and the member agrees to wear SCBA during all phases of fire suppression (i.e., ingress, suppression, overhaul, and egress).
- (9) The member has a signed statement from a pulmonary or asthma specialist, knowledgeable in the essential job tasks and hazards of fire fighting, that he/she meets the criteria specified in 9.7.6.1(1) through 9.7.6.1(6) and that the member can safely perform essential job tasks 1, 2, 3, 4, 5, 7, 9, and 13 without the use of bronchodilator "rescue" medications.

**9.7.6.2 Physician Guidance.** The physician shall consider the following when evaluating the member's asthmatic condition:

- (1) Exposures to exertion, temperature extremes, combustion by-products, irritants, and particulate matter are all potent provokers of asthma attacks.
- (2) Bronchodilator medications are not adequate maintenance therapy to control symptoms in the irritant environment of the fire ground or hazardous materials incident scene because their use has not been approved by the FDA for use on the fire ground or hazardous materials incident scene and because several studies have implicated the frequent use of beta-agonists (short- and long-acting bronchodilators) as an independent predictor or risk for sudden death and myocardial infarction in the United States, Canada, Britain, New Zealand, and Australia.
- (3) There is a high probability that acute hyperreactivity in this environment can induce immediate or progressive clinical asthma (bronchospasm and wheeze) that can lead to sudden incapacitation from status asthmaticus and/or cardiac ischemia. There are no studies that support or deny that asthma in this environment can be prevented or adequately controlled by anti-inflammatory medications (inhaled corticosteroids, cromolyn, leukotriene modifiers). It is not acceptable to use or rely on bronchodilator medications for this purpose because in a hazardous environment, SCBA cannot be removed to use a rescue inhaler, and there are no studies that support or deny that their use is preventive or effective in a fire/smoke environment.
- (4) The member's work history, as well as clinical findings on annual evaluation, should be used as an assessment of the member's practical ability to safely perform the essential job tasks.

#### 9.7.7\* Allergic Lower Respiratory Disorders.

**9.7.7.1 Physician Evaluation.** Allergic lower respiratory disorders might compromise the member's ability to safely perform essential job tasks 1, 2, 3, 4, 5, 7, 9, and 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.7.7.2 Physician Guidance.** The physician shall consider that allergic lower respiratory disorder, a term used to define asthma (clinical reversible bronchospasm), is triggered by a known allergic insult and once triggered these patients have demonstrable airway hyperreactivity for weeks to months; it can be recurrent and/or become permanent.

#### 9.7.8\* Chronic Obstructive Airways Diseases.

**9.7.8.1 Physician Evaluation.** Chronic obstructive airways diseases (chronic bronchitis, emphysema), if moderate to severe (absolute FEV<sub>1</sub>/FVC ratio less than or equal to 0.70 and an FEV<sub>1</sub> less than 70 percent predicted), compromises the member's ability to safely perform essential job tasks 1, 2, 3, 4, 5, 7, 9, and 13, and the physician shall report the applicable job limitations to the fire department.

#### 9.7.9 Hypoxemic Disorders.

**9.7.9.1 Physician Evaluation.** Hypoxemic disorders when moderate to severe (oxygen saturation less than or equal to 90 percent or a Po<sub>2</sub> less than or equal to 65 mm Hg, measured at rest and corrected to sea level) or the presence of significant exercise desaturation (a fall in oxygen saturation by 4 percent from baseline or to 90 percent or less) compromises the member's ability to safely perform essential job tasks 1, 2, 3, 4, 7, and 13, and the physician shall report the applicable job limitations to the fire department.



**9.7.9.2 Physician Guidance.** The physician shall recognize the following situations when evaluating the member:

- (1) A resting oxygen saturation of 91 to 93 percent corrected to sea level requires measurement at exercise to determine if desaturation (decrease in oxygen saturation by greater than or equal to 4 percent from baseline or to less than or equal to 90 percent) occurs.
- (2) Hypoxia can be the result of central regulatory disturbances, obstructive sleep apnea, asthma, chronic obstructive airways diseases, interstitial lung disease, pulmonary hypertension, chronic pulmonary embolism, and so forth.
- (3) In this environment, gas exchange abnormalities and respiratory insufficiency no matter the cause have the potential for life-threatening sudden incapacitation from cardiopulmonary insufficiency.

#### **9.7.10 Hypercapnic Disorders.**

**9.7.10.1 Physician Evaluation.** Hypercapnic disorders (elevated carbon dioxide with serum  $P_{CO_2}$  greater than or equal to 45 mm Hg) found during evaluation of respiratory complaints or disease compromise the member's ability to safely perform essential job tasks 1, 2, 3, 4, 5, 7, and 13, and the physician shall report the applicable job limitations to the fire department.

**9.7.10.2 Physician Guidance.** The physician shall consider that hypercapnia can be the result of central regulatory disturbance, medications, obstructive sleep apnea, severe asthma, end-stage chronic obstructive airways diseases, or end-stage interstitial lung disease. In this environment, gas exchange abnormalities and respiratory insufficiency no matter the cause have the potential for life-threatening sudden incapacitation from cardiopulmonary insufficiency.

#### **9.7.11 Pulmonary Hypertension.**

**9.7.11.1 Physician Evaluation.** Pulmonary hypertension compromises the member's ability to safely perform essential job tasks 1, 3, 4, 7, and 13, and the physician shall report the applicable job limitations to the fire department. *[For further details see sections on hypoxia (9.7.9), pulmonary embolism (9.7.20), and cardiac valve dysfunction (9.4.11).]*

#### **9.7.12 Tracheal Stenosis.**

**9.7.12.1 Physician Evaluation.** Tracheal stenosis might compromise the member's ability to safely perform essential job tasks 1, 2, 3, 4, 5, 7, and 12 if pulmonary dysfunction is reduced (FVC less than 60 percent of predicted or abnormal inspiratory flow volume loop) or if the underlying cause of the stenosis prevents the successful and safe performance of the essential job tasks, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.7.13 Pulmonary Resection Surgery, Chest Wall Surgery, or Traumatic Pneumothorax.**

##### **9.7.13.1 Physician Evaluation.**

**9.7.13.1.1** If the member has had pulmonary resection surgery, chest wall surgery, and/or traumatic pneumothorax, the physician shall evaluate the member for full recovery from the surgery with full pulmonary function testing (PFT), including spirometry, lung volumes, diffusion, and hemoglobin oxygen saturation.

**9.7.13.1.2** Abnormal PFTs or decreased gas exchange might compromise the member's ability to safely perform essential job tasks 1, 2, 3, 4, 7, and 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.7.13.2 Physician Guidance.** The physician shall consider the following when evaluating the member:

- (1) Pulmonary function tests should be performed after adequate healing and pain resolution; generally, this is 4 weeks after thorascopic surgery and 6 to 8 weeks after open-chest surgery.
- (2) Pulmonary function tests should be either normal or show only a minimal restrictive disorder without evidence for interstitial disease or gas exchange abnormalities.
- (3) Moderate to severe restriction (FVC less than 60 percent of predicted with an absolute  $FEV_1/FVC$  ratio greater than or equal to 0.90) or hypoxia compromises the member's ability to safely perform essential job tasks unless a more complete evaluation of gas exchange and exercise capacity shows the ability to exercise at a workload of 12 METs without evidence of exercise hemoglobin oxygen desaturation.

#### **9.7.14\* Spontaneous Pneumothorax.**

**9.7.14.1 Physician Evaluation.** Spontaneous pneumothorax, when present, might compromise the member's ability to safely perform essential job tasks 1, 2, 3, 4, 7, and 13 due to pain and dyspnea, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.7.14.2 Physician Guidance.** The physician shall consider that members with a history of spontaneous pneumothorax and cystic/bullous disease (e.g., as demonstrated on chest CAT scan) whose essential job task 4 includes SCUBA diving cannot safely perform this task since pressure changes during diving can induce recurrence.

#### **9.7.15 Fibrothorax, Chest Wall Deformity, and/or Diaphragm Abnormalities.**

**9.7.15.1 Physician Evaluation.** Fibrothorax, chest wall deformity, and/or diaphragm abnormalities might compromise the member's ability to safely perform essential job tasks 2, 4, and 7, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.7.15.2 Physician Guidance.** The physician shall consider that moderate to severe restriction (FVC less than 60 percent of predicted with an absolute  $FEV_1/FVC$  ratio greater than or equal to 0.90) compromises the member's ability to safely perform essential job tasks unless a more complete evaluation of gas exchange and exercise capacity shows the ability to exercise at a workload of 12 METs without evidence of hypoxia or exercise hemoglobin oxygen desaturation.

#### **9.7.16\* Pleural Effusions.**

**9.7.16.1 Physician Evaluation.** Pleural effusions might compromise the member's ability to safely perform essential job tasks 2, 4, and 7, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.



**9.7.17 Bronchiectasis and/or Bronchiolitis Obliterans.**

**9.7.17.1 Physician Evaluation.** Bronchiectasis and/or bronchiolitis obliterans might compromise the member's ability to safely perform essential job tasks 1, 2, 3, 4, 5, and 7, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.7.17.2 Physician Guidance.** The physician shall consider that the ability to safely perform essential job tasks is based on symptom (frequent productive cough, wheezing, and/or dyspnea) and disease severity (chest CAT scan demonstrating multi-lobar disease and pulmonary function tests demonstrating moderate to severe obstructive or restrictive dysfunction or gas exchange abnormalities).

**9.7.18 Interstitial Lung Diseases.**

**9.7.18.1 Physician Evaluation.** Interstitial lung diseases including pneumoconiosis (anthracosis, silicosis, asbestosis), hypersensitivity pneumonitis, eosinophilic pneumonitis, idiopathic pulmonary fibrosis, inhalation pneumonitis, and extensive pulmonary infections might compromise the member's ability to safely perform essential job tasks 1, 2, 3, 4, and 7, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.7.18.2 Physician Guidance.** The physician shall consider that moderate to severe restriction (FVC less than 60 percent of predicted with an absolute  $FEV_1$ /FVC ratio greater than or equal to 0.90) compromises the member's ability to safely perform essential job tasks unless a more complete evaluation of gas exchange and exercise capacity shows the ability to exercise at a workload of 12 METs without evidence of hypoxia or exercise hemoglobin oxygen desaturation.

**9.7.19 Sarcoidosis.**

**9.7.19.1 Physician Evaluation.** Sarcoidosis resulting in moderate or severe pulmonary dysfunction, significant visual impairment, cardiac dysfunction (cardiomyopathy or arrhythmia) at rest or exercise, other moderate to severe end-organ dysfunction, or the need for current treatment with systemic corticosteroids compromises the member's ability to safely perform essential job tasks 1, 2, 3, 4, 7, 8, and 13, and the physician shall report the applicable job limitations to the fire department.

**9.7.19.2 Physician Guidance.** The physician shall consider the following when evaluating a member with sarcoidosis:

- (1) Most patients with sarcoidosis are asymptomatic with abnormal chest imaging studies but normal function.
- (2) If functional assessment by individual examination, pulmonary function tests, ECG, and echocardiogram are normal, the member is capable of safely performing essential job tasks.
- (3) Moderate to severe restriction (FVC less than 60 percent of predicted with an absolute  $FEV_1$ /FVC ratio greater than or equal to 0.90) compromises the member's ability to safely perform essential job tasks unless a more complete evaluation of gas exchange and exercise capacity shows the ability to exercise at a workload of 12 METs without evidence of exercise hemoglobin oxygen desaturation.
- (4) Cardiac function should be formally assessed with echocardiography and ECG.

**9.7.20 Pulmonary Embolism.****9.7.20.1 Physician Evaluation.**

**9.7.20.1.1** Acute, recent, recurrent, or chronic pulmonary embolism requiring anticoagulation compromises the member's ability to safely perform essential job task 8, and the physician shall report the applicable job limitations to the fire department.

**9.7.20.1.2** Moderate to severe pulmonary dysfunction (restriction or gas exchange abnormalities) or pulmonary hypertension is rare but if present compromises the member's ability to safely perform essential job tasks 1, 2, 4, and 7, and the physician shall report the applicable job limitations to the fire department.

**9.7.21 Disorders of Respiratory Regulation.**

**9.7.21.1 Physician Evaluation.** Disorders of respiratory regulation can result in gas exchange abnormalities that might compromise the member's ability to safely perform essential job tasks 1, 2, 4, 7, and 9, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.7.21.2 Physician Guidance.** The physician shall consider that conditions including but not limited to obstructive sleep apnea, central apnea, and disordered central breathing regulation require evaluation of medical history, physical exam, pulmonary function tests, gas exchange, exercise tests, sleep tests, and other tests as deemed necessary.

**9.7.22 Cystic Lung Diseases.****9.7.22.1 Physician Evaluation.**

**9.7.22.1.1** Cystic lung diseases (e.g., congenital bullous disease, pneumatocele, blebs, cystic fibrosis) with significant abnormalities on chest film or moderate to severe pulmonary dysfunction (FVC less than 60 percent predicted or gas exchange abnormalities) compromise the member's ability to safely perform essential job tasks 1, 2, and 4, and the physician shall report the applicable job limitations to the fire department.

**9.7.22.1.2** Members shall be restricted from SCUBA diving if disease is moderate to severe on chest CAT imaging, even if pulmonary function tests are normal.

**9.7.23 Tuberculosis.** See Section 9.8.**9.7.24 Lung Cancer.** See Section 9.17.**9.7.25 Lung Transplant.**

**9.7.25.1 Physician Evaluation.** Lung function post-lung transplantation shall be considered as compromising a member's ability to safely perform essential job tasks (1, 2, 4, 5, 6, 7, 8, 9, 10, 13).

**9.8 Infectious Diseases.**

**9.8.1** Infectious diseases shall include systemic, local, acute, and chronic infections as well as post-infectious processes.

**9.8.2** When evaluating a member for infectious diseases, the physician shall consider the following:

- (1) Many infections interfere with control of body temperature, hydration, and nutritional status.



- (2) Many infections also produce severe pain, muscle weakness, compromise mobility, and/or ability to safely perform heavy physical exertion.
- (3) Members must be able to safely interact with other fire fighters and civilians without posing a significant public health risk due to contagious disease.
- (4) Acute and/or self-limited infectious processes can require temporary work restriction. Examples include influenza or upper respiratory tract infection, which can interfere with safe performance of essential job tasks 2 and 3, or acute dermatitis, which would interfere with safe performance of essential job task 3.
- (5) Following resolution of these acute processes, members can return to full duty.

**9.8.3** If the member has any infectious diseases, the member shall be individually evaluated in accordance with 9.8.4 through 9.8.12 to determine if the diseases compromise the member's ability to safely perform the essential job tasks.

#### **9.8.4 Skin Infections and Draining Ulcers or Cysts.**

**9.8.4.1 Physician Evaluation.** Skin infections and draining ulcers or cysts might compromise the member's ability to wear PPE (essential job tasks 2 and 5) or present too high a risk for exposure to infectious agents and toxins (essential job task 3), and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.8.5 Upper or Lower Respiratory Infections.**

**9.8.5.1 Physician Evaluation.** Upper or lower respiratory infections that result in excessive cough, inability to use SCBA, or pulmonary dysfunction might compromise the member's ability to safely perform essential job tasks 1, 2, 3, 4, 5, and 7, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.8.6 Ear Infections.**

**9.8.6.1 Physician Evaluation.** Ear infections that interfere with balance and/or hearing might compromise the member's ability to safely perform essential job tasks 8 and 12, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.8.7 Gastrointestinal Infections.**

**9.8.7.1 Physician Evaluation.** Gastrointestinal infections including parasites that result in dehydration or frequent use of toilet facilities at least temporarily might compromise the member's ability to safely perform essential job tasks 1, 5, 8, and 9, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.8.8 Kidney or Urinary Infections.**

**9.8.8.1 Physician Evaluation.** Kidney or urinary infections that result in dehydration or the frequent use of toilet facilities might compromise the member's ability to safely perform essential job tasks 1, 5, and 9, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **\* Infection That Results in Dizziness, Weakness, Significant Weight Loss, or Pain.**

**9.8.9.1 Physician Evaluation.** Any infection that results in dizziness, significant weakness, significant weight loss, or significant pain limiting functional capacity compromises the member's ability to safely perform essential job tasks 1, 5, 8, and 9, and the physician shall report the applicable job limitations to the fire department.

#### **9.8.10\* Active Pulmonary Tuberculosis.**

**9.8.10.1 Physician Evaluation.** Active pulmonary tuberculosis, by posing a public health risk to the community and other members, compromises the member's ability to safely perform essential job tasks 2, 4, 5, and 12, and the physician shall report the applicable job limitations to the fire department.

#### **9.8.11\* Hepatitis.**

**9.8.11.1 Physician Evaluation.** Hepatitis, specifically infectious diseases of the liver caused by viruses including but not limited to A, B, C, D, and E, and the treatment of hepatitis might compromise the member's ability to safely perform essential job tasks 1, 2, 4, 5, 7, 9, and 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.8.11.2 Physician Guidance.** Medical management of members following occupational exposure or development of any viral hepatitis shall conform to the current CDC guidelines, which includes recommendations for restriction from various types of duty. [See 7.7.8(2).]

#### **9.8.12\* Human Immunodeficiency Virus (HIV) Infection.**

**9.8.12.1 Physician Evaluation.** If the member has been diagnosed with human immunodeficiency virus (HIV) infection, the physician shall evaluate the member to determine if the member can perform the essential job tasks.

**9.8.12.1.1** AIDS and significant organ damage or dysfunction resulting from HIV infection compromise the member's ability to safely perform essential job tasks 1, 2, 4, 5, 7, 8, and 9 due to debilitation, and the physician shall report the applicable job limitations to the fire department.

**9.8.12.1.2** Anemia, cardiopulmonary dysfunction, or neurologic dysfunction compromises the member's ability to safely perform essential job tasks 1, 2, 3, 4, 5, 7, 9, and 13, and the physician shall report the applicable job limitations to the fire department.

**9.8.12.1.3** Peripheral neuropathy compromises the member's ability to safely perform essential job tasks 1, 3, and 5, and the physician shall report the applicable job limitations to the fire department.

**9.8.12.1.4** Dementia compromises the member's ability to safely perform essential job tasks 1, 11, and 12, and the physician shall report the applicable job limitations to the fire department.

#### **9.9\* Spine Disorders.**

**9.9.1** Spine disorders shall include conditions of the cervical, thoracic, and lumbosacral spine such as strains, fractures, and discogenic disease as well as cord, cauda equina, and paraspinous syndromes.



**9.9.2** When evaluating a member for spine disorders, the physician shall consider the following:

- (1) Fire fighters with active, ongoing, or recurrent spinal disorders can have difficulty due to reduced motor strength, sensation, and flexibility as well as problems with fatigue, coordination, gait, and equilibrium.
- (2) The personal protective ensemble and SCBA can place the fire fighter's spine at a biomechanical disadvantage due to added weight and altered center of gravity.

**9.9.3** If the member has any spine disorders, the member shall be individually evaluated in accordance with 9.9.4 through 9.9.9 to determine if the disorders compromise the member's ability to safely perform the essential job tasks.

#### **9.9.4 Spinal Fusion.**

**9.9.4.1 Physician Evaluation.** Spinal fusion that results in instability or reduced mobility, strength, range of motion, or persistent pain compromises the member's ability to safely perform essential job tasks 1, 2, 4, 5, 6, 7, 8, and 13, and the physician shall report the applicable job limitations to the fire department.

#### **9.9.5 Ankylosing Spondylitis.**

**9.9.5.1 Physician Evaluation.** Ankylosing spondylitis might compromise the member's ability to safely perform essential job tasks 1, 2, 4, 5, 6, 7, and 8, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.9.6 Spinal Condition with Significant Radiculopathy.**

**9.9.6.1 Physician Evaluation.** Spinal condition with significant radiculopathy resulting in peripheral motor weakness, loss of strength, loss of sensation, and loss of reflexes affecting endurance, strength, flexibility, pain, and/or gait disturbances compromises the member's ability to safely perform essential job tasks 1, 2, 4, 5, 6, 7, 8, and 13, and the physician shall report the applicable job limitations to the fire department.

#### **9.9.7 Use of Narcotics or Muscle Relaxants.**

**9.9.7.1 Physician Evaluation.** The use of narcotics or muscle relaxants to treat any spinal condition compromises the member's ability to safely perform essential job tasks 1, 2, 4, 5, 6, 7, 8, and 13, and the physician shall report the applicable job limitations to the fire department.

**9.9.7.2 Physician Guidance.** The physician shall consider that medication-induced somnolence, discoordination, and/or disequilibrium compromise a member's ability to safely operate in hazardous environments.

#### **9.9.8 Spine Structural Abnormality, Fracture, or Dislocation.**

**9.9.8.1 Physician Evaluation.** Spine structural abnormality, fracture, or dislocation that causes progressive or recurrent impairment might compromise the member's ability to safely perform essential job tasks 1, 2, 4, 5, 6, 7, 8, and 13 due to limitations of endurance, strength, flexibility, or pain, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.9.8.2 Physician Guidance.** The physician shall consider that spinal structural abnormality, a fracture, or a dislocation can

also result in ligament instability, increasing the risk for future dislocation and neurologic compromise.

#### **9.9.9 Herniation of Nucleus Pulposus.**

**9.9.9.1 Physician Evaluation.** Herniation of nucleus pulposus or a history of laminectomy, discectomy, or single-level fusion might compromise the member's ability to safely perform essential job tasks 1, 2, 4, 5, 6, 7, 8, and 13 due to pain or limitations of endurance, strength, or flexibility, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.10\* Orthopedic Disorders.**

**9.10.1** Orthopedic disorders shall include injuries and illnesses involving upper extremities, pelvis, and lower extremities including nerves, muscles, tendons, joints, and bones.

**9.10.2** When evaluating a member for orthopedic disorders, the physician shall consider the following:

- (1) Fire fighters with active, ongoing, or recurrent orthopedic disorders can have difficulty due to reduced motor strength, sensation, and flexibility as well as problems with fatigue, coordination, gait, and equilibrium.
- (2) The personal protective ensemble and SCBA can place the fire fighter's involved extremity (upper or lower) at a biomechanical disadvantage due to added weight and altered center of gravity.
- (3) Certain medications (narcotics and muscle relaxants) used to treat orthopedic conditions can produce or worsen somnolence, discoordination, and disequilibrium.

**9.10.3** If the member has any orthopedic disorders, the member shall be individually evaluated in accordance with 9.10.4 through 9.10.20 to determine if the disorders compromise the member's ability to safely perform the essential job tasks.

#### **9.10.4 Amputation of Arm, Hand, or Thumb.**

**9.10.4.1 Physician Evaluation.** Amputation of an arm, hand, or thumb compromises the member's ability to safely perform essential job tasks 1, 2, 6, 7, and 8, and the physician shall report the applicable job limitations to the fire department.

**9.10.4.2 Physician Guidance.** When evaluating a member with an amputation of the arm, hand, or thumb, the physician shall consider the following:

- (1) The amputation of these limbs or joints impairs grip and other physical abilities required to safely perform essential job tasks.
- (2) Prosthetic limbs do not provide adequate function to safely perform these essential job tasks rapidly in a life-threatening, unforgiving environment.

#### **9.10.5 Amputation of Leg.**

**9.10.5.1 Physician Evaluation.** Amputation of a leg above the knee compromises the member's ability to safely perform essential job tasks 1, 4, 6, 7, and 8, and the physician shall report the applicable job limitations to the fire department.

**9.10.5.2 Physician Guidance.** When evaluating a member with an amputation of a leg (above or below the knee) or entire foot, the physician shall consider the following:

- (1) The amputation of these limbs or joints significantly impacts ambulation and other weight-bearing activities required to safely perform essential job tasks.

- (2) Prosthetic limbs might not provide adequate function to safely perform these essential job tasks in an immediately dangerous to life and health (IDLH) environment.
- (3) To safely perform the essential job tasks in Chapter 5, an incumbent with a below-the-knee (BKA) amputation and a state-of-the-art prosthesis shall meet all of the following requirements:
  - (a) A stable, unilateral BKA with at least the proximal third of the tibia present for a strong and stable attachment point with the prosthesis
  - (b) Fitted with a prosthesis that will tolerate the conditions present in structural firefighting, when worn in conjunction with standard fire fighting PPE
  - (c) At least 6 months of prosthetic use in a variety of physically demanding activities with no functional difficulties
  - (d) The amputee limb is healed with no significant inflammation, persistent pain, necrosis, or indications of instability at the amputee limb attachment point
  - (e) Demonstrates no disabling psychosocial issues pertaining to the loss of limb and/or use of prosthesis
  - (f) Evaluated by a prosthetist or orthopedic specialist with expertise in the fitting and function of prosthetic limbs who concurs that the candidate can complete all essential job tasks listed in Chapter 9, including wearing personal protective ensembles and SCBA while climbing ladders, operating from heights, and walking or crawling in the dark along narrow and uneven surfaces that might be wet or icy

#### 9.10.6 Amputation of Finger(s) Other than Thumb.

**9.10.6.1 Physician Evaluation.** Amputation of finger(s) other than a thumb might compromise the member's ability to safely perform essential job tasks 1, 2, 6, 7, and 8, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.10.6.2 Physician Guidance.** The physician shall consider that the amputation of these limbs or joints might interfere with grip and other physical abilities required to safely perform essential job tasks.

#### 9.10.7 Amputation of Partial Foot or Toe(s).

**9.10.7.1 Physician Evaluation.** Amputation of a partial foot or toe(s) might compromise the member's ability to safely perform essential job tasks 1, 4, 6, 7, and 8, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.10.7.2 Physician Guidance.** The physician shall consider that the amputation of these limbs or joints might prevent ambulation and other physical abilities required to safely perform essential job tasks.

#### 9.10.8 Dislocation of a Joint.

**9.10.8.1 Physician Evaluation.** Single episode of joint dislocation or dislocation with residual limitation of motion (depending upon degree) might compromise the member's ability to safely perform essential job tasks 1, 2, 4, 6, 7, and 8, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.10.8.2 Physician Guidance.** The physician shall consider that successful surgery for shoulder dislocation, if range of motion

and strength were intact, would not interfere with the safe performance of essential job tasks.

#### 9.10.9 Recurrent Joint Dislocation of a Major Joint.

**9.10.9.1 Physician Evaluation.** Recurrent joint dislocation of a major joint (e.g., shoulder) compromises the member's ability to safely perform essential job tasks 1, 2, 4, 6, 7, and 8, and the physician shall report the applicable job limitations to the fire department.

**9.10.9.2 Physician Guidance.** When evaluating a member for recurrent joint dislocation, the physician shall consider the following:

- (1) Unrepaired, repeated joint dislocations indicate an unstable shoulder or hip, which can easily dislocate leading to sudden incapacitation, placing the member or the person depending on the member at life-threatening risk.
- (2) Post-surgical repair, the member can safely perform essential job tasks if joint exam shows full functional motion, strength, and stability.

#### 9.10.10 Ligament and/or Meniscus Knee Disease.

**9.10.10.1 Physician Evaluation.** Ligament and/or meniscus knee disease with symptoms of locking, buckling, or giving-way compromises the member's ability to safely perform essential job tasks 1, 4, 6, 7, and 8, and the physician shall report the applicable job limitations to the fire department.

**9.10.10.2 Physician Guidance.** When evaluating a member for ligament and/or meniscus knee disease, the physician shall consider the following:

- (1) Ligament and/or meniscus knee disease can lead to sudden incapacitation, placing the member or the person depending on the member at life-threatening risk.
- (2) Post-surgical repair, the member can safely perform essential job tasks if joint exam shows full functional motion, strength, and stability.

#### 9.10.11 Joint Replacements or Artificial Joints.

**9.10.11.1 Physician Evaluation.** Joint replacements or artificial joints compromise the member's ability to safely perform essential job tasks 1, 4, 6, 7, and 8, and the physician shall report the applicable job limitations to the fire department.

**9.10.11.2 Physician Guidance.** When evaluating a member with joint replacements or artificial joints, the physician shall verify that all of the following conditions are met:

- (1) Normal range of motion without history of dislocations post-replacement
- (2) Repetitive and prolonged pulling, bending, rotations, kneeling, crawling and climbing without pain or impairment
- (3) No limiting pain
- (4) An evaluation by an orthopedic specialist concurring that the incumbent can complete all essential job tasks listed in Chapter 9

#### 9.10.12 Limitation of Joint Motion.

**9.10.12.1 Physician Evaluation.** Limitation of joint motion (depending upon degree) might compromise the member's ability to safely perform essential job tasks 1, 2, 4, 6, 7, and 8 due to reduced flexibility, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.





**9.10.13 Joint Reconstruction.**

**9.10.13.1 Physician Evaluation.** Joint reconstruction in cases where there is significant residual limitation of motion or strength compromises the member's ability to safely perform essential job tasks 1, 4, 6, 7, and 8, and the physician shall report the applicable job limitations to the fire department.

**9.10.13.2 Physician Guidance.** The physician shall consider that surgery for a torn anterior cruciate ligament or meniscus can interfere with safe performance of essential job tasks 1, 4, 6, 7, and 8 if quadriceps strength is reduced or if the knee is unstable or develops pain or swelling when stressed.

**9.10.14 Fractures.**

**9.10.14.1 Physician Evaluation.** Fracture(s) might compromise the member's ability to safely perform essential job tasks 1, 4, 6, 7, and 8, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.10.14.2 Physician Guidance.** When evaluating a member with a fracture, the physician shall consider the following:

- (1) Fractures, including hip fractures requiring internal fixation, should not interfere with safe performance of essential job tasks as long as the radiograph demonstrates healing and exam is normal.
- (2) Non-union fractures are not healed, and members cannot safely perform essential job tasks 1, 4, 6, 7, and 8 until union is achieved.

**9.10.15 Appliances.**

**9.10.15.1 Physician Evaluation.** Appliances (screws, pins, and/or metal plates) might compromise the member's ability to safely perform essential job tasks 1, 4, 6, 7, and 8, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.10.15.2 Physician Guidance.** When evaluating a member with appliances, the physician shall consider the following:

- (1) If the appliances are superficial, they could lead to perforation of the skin under the normal abrasive conditions of fire fighting.
- (2) If the underlying condition responsible for the surgical implantation has healed, surgical consultation is advised to determine the risk-benefit analysis for removing the appliance.
- (3) After removing the appliance, radiographic evidence of bone healing at approximately 6 months post-removal should be obtained before the member is allowed to safely perform the essential tasks.

**9.10.16 Bone Grafts.**

**9.10.16.1 Physician Evaluation.** Bone grafts might compromise the member's ability to safely perform essential job tasks 1, 4, 6, 7, and 8, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.10.16.2 Physician Guidance.** The physician shall consider that bone grafts, if well healed, do not interfere with the safe performance of job tasks as long as the radiograph demonstrates healing and the exam is normal.

**9.10.17 Chronic Osteoarthritis or Traumatic Arthritis.**

**9.10.17.1 Physician Evaluation.** Chronic osteoarthritis or traumatic arthritis resulting in frequent episodes of pain and/or reduced range of motion, strength, or endurance compromises the member's ability to safely perform essential job tasks 1, 4, 6, 7, and 8, and the physician shall report the applicable job limitations to the fire department.

**9.10.18 Inflammatory Arthritis.**

**9.10.18.1 Physician Evaluation.** Inflammatory arthritis (in cases where it is severe, recurrent, or a progressive illness or associated with deformity or limitation of range of motion), which can result in frequent episodes of pain, reduced strength, and reduced flexibility, compromises the member's ability to safely perform essential job tasks 1, 4, 6, 7, and 8, and the physician shall report the applicable job limitations to the fire department.

**9.10.19 Reflex Sympathetic Dystrophy.**

**9.10.19.1 Physician Evaluation.** Reflex sympathetic dystrophy where pain is severe, narcotics or muscle relaxants are required, or strength/flexibility is limited compromises the member's ability to safely perform essential job tasks 1, 4, 6, 7, and 8, and the physician shall report the applicable job limitations to the fire department.

**9.10.20 Osteomyelitis or Septic Arthritis.**

**9.10.20.1 Physician Evaluation.** Osteomyelitis or septic arthritis, if active and causing pain, local drainage, systemic infection, and/or increased risk for pathologic or traumatic fractures, compromises the member's ability to safely perform essential tasks 1, 4, 6, 7, and 8, and the physician shall report the applicable job limitations to the fire department.

**9.11 Disorders Involving the Gastrointestinal Tract and Abdominal Viscera.**

**9.11.1 Disorders involving the gastrointestinal (GI) tract and abdominal viscera** shall include conditions of the abdominal wall and peritoneum, as well as esophagus, stomach, small bowel, colon, mesenteric structures, and intra-abdominal organs.

**9.11.2** If the member has any disorders involving the gastrointestinal tract and abdominal viscera, the member shall be individually evaluated for the likelihood of inadequate nutrition, a propensity for symptomatic dehydration, anemia, or incapacitating pain syndromes.

**9.11.3** Where the following GI disorders result in the complications defined in 9.11.2, the physician shall evaluate the member's ability to safely perform essential job tasks 1, 4, 6, 7, 9, and 13, and after the evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department:

- (1) Cholecystitis
- (2) Gastritis
- (3) GI bleeding
- (4) Inflammatory bowel disease or irritable bowel syndrome
- (5) Intestinal obstruction
- (6) Pancreatitis
- (7) Diverticulitis
- (8) History of gastrointestinal surgery
- (9) Gastric or other GI ulcers, including Zollinger-Ellison syndrome
- (10) Cirrhosis

- (1) Splenectomy, if healed, does not compromise the member's ability to safely perform essential job tasks. To prevent infections, Pneumovax is recommended at regular intervals.
- (12) Hernias, such as the following:
  - (a) Hernias of the abdominal wall, especially inguinal and femoral hernias, might compromise the member's ability to safely perform essential job tasks 1, 4, 6, 7, and 13 due to the risk of incarceration and bowel strangulation during heavy exertion and lifting.
  - (b) Large ventral hernias have a low risk of incarceration but can weaken the abdominal wall musculature and might compromise the member's ability to safely perform essential job tasks 1, 4, 6, and 7.
  - (c) Umbilical hernias that are small and asymptomatic will not generally interfere with fire-fighting duties.
  - (d) Abdominal wall hernias at any site that have been surgically corrected do not prevent otherwise qualified members from safely performing essential fire-fighting tasks, provided the incision site is well healed and the surgeon has cleared the member for full lifting.

## 9.12 Medical Conditions Involving Head, Eyes, Ears, Nose, Neck, or Throat.

### 9.12.1\* Physician Evaluation.

**9.12.1.1** If the member has any medical conditions involving the head, eyes, ears, nose, neck, or throat, the member shall be individually evaluated for conditions that interfere with the member's ability to comfortably wear and be protected by the fire fighter's protective ensemble and that might compromise the member's ability to safely perform essential job tasks 2, 4, 5, and 13.

**9.12.1.2** After the evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.12.2 Physician Guidance.** When evaluating a member with medical conditions involving the head, eyes, ears, nose, neck, or throat, the physician shall consider the following:

- (1) Deformities of the skull associated with evidence of disease of the brain, spinal cord, or peripheral nerves can result in the potential for sudden incapacitation and the inability to properly wear protective equipment.
- (2) Contraction of head and neck muscles can interfere with wearing of protective equipment, impair speech, or otherwise compromise a member's ability to safely perform essential job tasks.

### 9.12.3 Disorders of the Eyes or Vision.

**9.12.3.1\* Physician Evaluation.** Disorders of the eyes or vision including the following might compromise the member's ability to safely perform essential job tasks 6, 8, 10, and 11, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department:

- (1)\*Far visual acuity worse than 20/40 binocular corrected with contact lens or spectacles, and far visual acuity uncorrected worse than 20/100 binocular for wearers of hard contacts or spectacles, compromises a member's ability to safely perform essential job tasks 6, 8, 10, and 11. Success-

ful soft contact lens wearers shall not be subject to the uncorrected standard.

- (2)\*Monocular vision, stereopsis without fusional capacity, inadequate depth perception, or loss of peripheral vision (greater than 110 degrees on confrontation) compromises the member's ability to safely perform essential job task 10.
- (3) Peripheral vision in the horizontal meridian of less than 110 degrees in the better eye or any condition that significantly affects peripheral vision in both eyes.

**9.12.3.2 Physician Guidance.** The physician shall consider that new monocular vision requires a minimum of 6 months for depth perception accommodation in order to safely perform other essential job tasks.

### 9.12.4 Abnormal Hearing.

**9.12.4.1\* Physician Evaluation.** Abnormal hearing requiring a hearing aid, cochlear implant, or impairing a member's ability to hear and understand the spoken voice under conditions of high background noise, or hear, recognize, and directionally locate cries or audible alarms, compromises the member's ability to safely perform essential job tasks 2, 6, 8, 10, 12, and 13, and the physician shall report the applicable job limitations to the fire department.

### 9.12.5 Vertigo, Ataxia, or Disturbance of Gait and Balance.

**9.12.5.1\* Physician Evaluation.** Any condition causing chronic or recurring vertigo, ataxia, or other disturbance of gait and balance compromises the member's ability to safely perform essential job tasks 1, 8, 10, and 13, and the physician shall report the applicable job limitations to the fire department.

### 9.12.6 Nose, Nasopharynx, Oropharynx, or Dental Structures.

**9.12.6.1\* Physician Evaluation.** Any deformity or disease of the nose, nasopharynx, oropharynx, or dental structures, including anosmia and sinusitis, might compromise the member's ability to safely perform essential job tasks 2, 3, 5, 8, 12, and 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.12.6.2 \* Physician Guidance.** Obstructive sleep apnea, if not properly treated, might compromise the member's ability to safely perform essential job tasks 2, 3, 5, 8, 12, and 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

### 9.13\* Neurologic Disorders.

**9.13.1** Neurologic disorders shall refer to ongoing, chronic, or recurrent disorders that impair an individual's neurological functions, including central regulation, cognitive abilities, strength, perception, reflexes, coordination, gait, and equilibrium.

**9.13.2** If the member has any neurologic disorder that significantly impairs the member's neurologic functions, including central regulation, cognitive abilities, strength, perception, reflexes, coordination, gait, and equilibrium, the member shall be individually evaluated in accordance with 9.13.3 through 9.13.11 to determine if the disorders compromise the member's ability to safely perform the essential job tasks.

### 9.13.3 Ataxias.

**9.13.3.1 Physician Evaluation.** Ataxias of the hereditary or degenerative type compromise a member's ability to safely per-



form essential job tasks 1, 4, 6, 7, and 8, and the physician shall report the applicable job limitations to the fire department.

#### **9.13.4 Cerebral Arteriosclerosis.**

**9.13.4.1\* Physician Evaluation.** Cerebral arteriosclerosis as evidenced by documented episodes of focal, reversible, or neurological impairment might interfere with the member's ability to safely perform essential job tasks 1 through 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.13.4.1.1** Cerebral arteriosclerosis as evidenced by documented episodes of focal, reversible, or neurological impairment, if irreversible, compromises the member's ability to safely perform essential job tasks 1 through 13, and the physician shall report the applicable job limitations to the fire department.

**9.13.4.1.2** Cerebral arteriosclerosis as evidenced by documented episodes of focal, reversible, or neurological impairment, if requiring anticoagulation treatment, compromises the member's ability to safely perform essential job task 8, and the physician shall report the applicable job limitations to the fire department.

#### **9.13.5 Neuromuscular, Demyelinating, and Other Progressive Neurologic Diseases.**

**9.13.5.1\* Physician Evaluation.** Neuromuscular, demyelinating, and other progressive neurologic diseases compromise the member's ability to safely perform essential job tasks 1, 4, 6, 7, 8, 12, and 13, and the physician shall report the applicable job limitations to the fire department, unless the member is free of clinical disease for 3 years and annual evaluation by a specialist concludes that cognitive function and neurologic exam are normal and the member is on no drugs that can impair job function.

**9.13.5.2 Physician Guidance.** The physician shall consider that this category refers to but is not limited to multiple sclerosis, myasthenia gravis, muscular dystrophies, Huntington's chorea, amyotrophic lateral sclerosis, and bulbar palsy.

#### **9.13.6 Single Unprovoked Seizure and Epileptic Conditions.**

**9.13.6.1\* Physician Evaluation.** Single unprovoked seizure and epileptic conditions, including simple, partial complex, generalized, and psychomotor seizure disorders, compromise the member's ability to safely perform essential job tasks 8, 9, 10, 11, and 13, and the physician shall report the applicable job limitations to the fire department unless the member meets all of the following provisions:

- (1) The member has had no seizures for 1 year off all anti-epileptic medication or has been 5 years seizure free on a stable medical regimen.
- (2) Neurologic examination is normal.
- (3) Imaging (CAT or MRI scan) studies are normal.
- (4) Awake and asleep EEG studies with photic stimulation and hyperventilation are normal.
- (5) A definitive statement from a qualified neurological specialist verifies that the member meets the criteria specified in 9.13.6.1(1) through 9.13.6.1(4) and that the member can safely perform the essential job tasks of fire fighting.

#### **9.13.7 Cerebral Vascular Bleeding.**

**9.13.7.1\* Physician Evaluation.** Cerebral vascular bleeding compromises the member's ability to safely perform essential job tasks 1, 4, 6, 7, 8, 9, 10, 11, 12, and 13, and the physician shall report the applicable job limitations to the fire department un-

less the cause of bleeding is surgically corrected, exam (including blood pressure) is normal, and studies (imaging and EEG) are normal off anticonvulsants.

#### **9.13.8 Head Trauma.**

**9.13.8.1\* Physician Evaluation.** Head trauma including concussion, brain contusion, subarachnoid hemorrhage, subdural, and/or epidural hematoma might compromise the member's ability to safely perform essential job tasks 1 through 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.13.8.2 Physician Guidance.** The physician shall consider having the member evaluated and cleared to return to duty by a qualified neurosurgeon or neurologist following significant head trauma.

#### **9.13.9 CNS Tumors.**

**9.13.9.1 Physician Evaluation.** CNS tumors, depending on their location and the size of the mass, might compromise the member's ability to safely perform essential job tasks 1 through 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.13.9.2 Physician Guidance.** The physician shall consider that after successful resection of a CNS tumor a member can safely return to duty with a neurosurgeon's certification if exam and imaging studies are normal (except for surgical site) and EEG shows no epileptic activity off all anti-convulsant medications.

**9.13.9.2.1** Where applicable, metastatic workup shall be negative.

#### **9.13.10 Parkinson's and Other Diseases with Tremor.**

**9.13.10.1 Physician Evaluation.** Parkinson's and other diseases with functionally significant tremor or abnormal gait or balance compromise the member's ability to safely perform essential job tasks 1, 2, 4, 5, 6, 7, 8, and 9, and the physician shall report the applicable job limitations to the fire department.

#### **9.13.10.2 Physician Guidance.**

**9.13.10.2.1** The physician shall evaluate gait, balance, movement, and medications required to maintain function.

**9.13.10.2.2** The impact of the operational environment including heat, hazards, stress, and exertion shall be considered and specifically addressed.

#### **9.13.11 Progressive Dementia.**

**9.13.11.1 Physician Evaluation.** Progressive dementia (e.g., Alzheimer's) compromises the member's ability to safely perform essential job tasks 1 through 13, and the physician shall report the applicable job limitations to the fire department.

#### **9.14\* Psychiatric and Psychologic Disorders.**

**9.14.1** Psychiatric and psychologic disorders shall include acute, ongoing, chronic, or recurrent disorders that impair psychological or emotional function.

**9.14.2** Psychiatric and psychologic disorders might compromise the member's ability to safely perform essential job tasks



1, 3, 4, 5, 7, 8, 11, 12, and 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.15\* Substance Abuse.**

**9.15.1** Substance abuse shall refer to the frequent and/or persistent use of alcohol or other substances causing the following:

- (1) Failure to fulfill major obligations either at work or at home
- (2) Verifiable physical or emotional harm to the member
- (3) Recurrent legal problems
- (4) Exacerbation of social and/or other interpersonal problems

**9.15.2** If the member has any substance abuse problem, the member shall be referred for counseling/treatment and individually evaluated in accordance with 9.15.3 through 9.15.4 to determine if the problem compromises the member's ability to safely perform the essential job tasks.

#### **9.15.3 DSM IV Criteria.**

**9.15.3.1 Physician Evaluation.** DSM IV criteria for substance abuse of alcohol and controlled substances compromise the member's ability to safely perform essential job tasks 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13, and the physician shall report the applicable job limitations to the fire department.

#### **9.15.3.2 Physician Guidance.**

**9.15.3.2.1** The physician shall use medical evaluations, supervisory evaluations, and/or performance evaluations coupled with urine screen and blood toxicology to form a basis for determining and documenting substance abuse.

**9.15.3.2.2** Although there is a high recidivism rate with treatment, members shall be offered counseling/treatment, because in most cases substance abuse is a medical illness.

#### **9.15.4 Methadone Maintenance.**

**9.15.4.1 Physician Evaluation.** Methadone maintenance interferes with cognitive functions, energy, coordination, and equilibrium of the member, and therefore compromises the member's ability to safely perform essential job tasks 1, 4, 5, 7, 8, 10, and 11, and the physician shall report the applicable job limitations to the fire department.

#### **9.16 Medications.**

**9.16.1** Medications shall include prescribed and over-the-counter medications.

**9.16.2** When evaluating a member, the physician shall recognize that the medications in Section 9.16 are listed because of noteworthy side effects that might interfere with the performance of essential job tasks.

**9.16.3** If the member is taking medications, the member shall be individually evaluated in accordance with 9.16.4 through 9.16.12 to determine if the medications compromise the member's ability to safely perform the essential job tasks.

#### **9.16.4 Anticoagulation.**

**9.16.4.1 Physician Evaluation.** Full-dose or low-dose anticoagulation or any drugs that prolong prothrombin time, partial thromboplastin time, or international normalized ratio (INR) compromise the member's ability to perform essential job task 8 due to the risk of internal bleeding from trauma with potential for rapid incapacitation from shock or central nervous sys-

tem hemorrhage, and the physician shall report the applicable job limitations to the fire department.

#### **9.16.5 Narcotics.**

**9.16.5.1 Physician Evaluation.** Narcotics compromise the member's ability to safely perform essential job tasks 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 due to alterations in mental status including vigilance, judgment, and other neurologic functions, and the physician shall report the applicable job limitations to the fire department.

#### **9.16.6 Muscle Relaxants.**

**9.16.6.1 Physician Evaluation.** Muscle relaxants compromise the member's ability to safely perform essential job tasks 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 due to alterations in mental status and other neurologic functions, and the physician shall report the applicable job limitations to the fire department.

#### **9.16.7 Sedatives and Hypnotics.**

**9.16.7.1 Physician Evaluation.** Sedatives and hypnotics compromise the member's ability to safely perform essential job tasks 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 due to alterations in mental status, vigilance, judgment, and other neurologic functions, and the physician shall report the applicable job limitations to the fire department.

#### **9.16.8 Psychiatric Medications.**

**9.16.8.1 Physician Evaluation.** Psychiatric medications might compromise the member's ability to safely perform essential job tasks 5, 8, 11, and 13 due to increased risk of heat stress, movement disorders, and somnolence, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.16.9 Anti-Hypertensive Agents.**

**9.16.9.1 Physician Evaluation.** Certain classes of anti-hypertensive agents (e.g., beta-blockers, high-dose diuretics, and central agents such as clonidine) compromise the member's ability to safely perform essential job tasks 5 and 8 due to risk for dehydration, electrolyte disorders, lethargy, and dis-equilibrium, and the physician shall report the applicable job limitations to the fire department.

**9.16.9.2 Physician Guidance.** If the member is on beta-blockers, high-dose diuretics, or central agents such as clonidine, the physician shall refer the member back to his/her physician for consideration of a change in anti-hypertensive medications.

**9.16.9.2.1** Once stable off these medications, the member shall be medically re-evaluated for duty.

**9.16.9.2.2** Calcium channel blockers shall be acceptable as anti-hypertensive medications, but if used for other cardiac reasons, refer to Section 9.4.

#### **9.16.10 High-Dose Corticosteroids.**

**9.16.10.1 Physician Evaluation.** High-dose corticosteroids for chronic disease compromise the member's ability to safely perform essential job tasks 5 and 8 due to the underlying disease or the risk for dehydration, electrolyte disorders, myopathy, altered sensorium, and/or lethargy, and the physician shall report the applicable job limitations to the fire department.

**9.16.10.2 Physician Guidance.** If the member is on systemic corticosteroids, other than high-dose corticosteroids, the physician shall refer the member back to his/her physician for consid-



eration of the underlying disease that might compromise the member's ability to safely perform the essential job tasks.

#### 9.16.11 Anabolic Steroids.

**9.16.11.1 Physician Evaluation.** Anabolic steroids compromise the member's ability to safely perform essential job tasks 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 due to alterations in mental status including vigilance, judgment, and other neurologic functions, and the physician shall report the applicable job limitations to the fire department.

#### 9.16.12 Other Medications.

**9.16.12.1 Physician Evaluation.** The physician shall evaluate the member to determine if other medications might compromise the member's ability to safely perform essential job tasks 5, 8, 11, and 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.16.12.2 Physician Guidance.** The physician shall consider that the member might require careful evaluation for increased risk of heat stress and other side effects of certain medications (e.g., MAOIs, phenothiazines, anti-cholinergics, tricyclic antidepressants), and shall ensure specialized annual follow-up of members taking these medications.

#### 9.17 Tumors — Malignant or Benign.

**9.17.1** Malignant conditions of any organ system can produce specific organ dysfunction or generalized debilitation.

**9.17.2** When evaluating a member, the physician shall recognize that malignancy or its treatment can result in anemia, malnutrition, pain, and generalized weakness, temporarily or permanently compromising the member's ability to safely perform essential job tasks 1 through 13.

**9.17.3** If the member has tumor, whether malignant or benign, the member shall be individually evaluated in accordance with 9.17.4 through 9.17.12 to determine if the tumors compromise the member's ability to safely perform the essential job tasks.

#### 9.17.4 Benign Tumors.

**9.17.4.1 Physician Evaluation.** A benign tumor, depending on its location, might compromise the member's ability to safely perform essential job tasks 1 through 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.17.4.2 Physician Guidance.** The physician shall consider that benign tumors will compromise the member's ability to safely perform essential job tasks 1 through 13 only if the space-occupying lesion and/or its treatment affects energy levels or the involved organ system's function.

#### 9.17.5 Acute Illness Related to Malignancy or Its Treatment.

**9.17.5.1 Physician Evaluation.** Acute illness related to malignancy or its treatment might compromise the member's ability to safely perform essential job tasks 1, 2, 3, 4, 5, 6, 7, 8, 9, and 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

**9.17.5.2 Physician Guidance.** The physician shall consider that acute illness related to malignancy or its treatment compromises the member's ability to safely perform essential job tasks 1, 2, 3, 4,

5, 6, 7, 8, 9, and 13 if low energy levels, anemia, weight loss, or specific aspects of that organ's dysfunction lead to debilitation.

#### 9.17.6 Central Nervous System Tumors.

**9.17.6.1 Physician Evaluation.** Central nervous system tumors might compromise the member's ability to safely perform essential job tasks 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### 9.17.6.2 Physician Guidance.

**9.17.6.2.1** When evaluating the member for central nervous system tumors, the physician shall consider that central nervous system tumors compromise the member's ability to safely perform essential job tasks 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 if low energy levels, anemia, undernutrition, weight loss, and specific organ dysfunction (seizures, loss of balance, inability to communicate, inability to process complicated commands in an emergency situation, weakness) are present or lead to a debilitated state affecting anaerobic and aerobic job tasks and the ability to wear personal protective ensembles and SCBA.

**9.17.6.2.2** If treated successfully, the member shall undergo evaluation by a specialist who must certify that the exam is normal, imaging studies are normal (except for surgical site), and seizures have not occurred in the absence of anticonvulsant medications, and there is no further evidence of malignancy.

#### 9.17.7 Head and Neck Malignancies.

**9.17.7.1 Physician Evaluation.** Head and neck malignancies might compromise the member's ability to safely perform essential job tasks 1 through 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### 9.17.7.2 Physician Guidance.

**9.17.7.2.1** When evaluating the member for head and neck malignancies, the physician shall consider that head and neck malignancies compromise the member's ability to safely perform essential job tasks 1 through 13 if low energy levels, anemia, undernutrition, weight loss, inability to clear oral secretions, or other specific organ dysfunction interfere with respiration, communication, hydration, and/or eating.

**9.17.7.2.2** If treated successfully, a member shall undergo evaluation by a specialist, who must certify that exam shows normal function, imaging studies show no tumor, and overall medical evaluation reveals no condition that might compromise safe performance of essential job tasks.

#### 9.17.8 Lung Cancer.

**9.17.8.1 Physician Evaluation.** Lung cancer might compromise the member's ability to safely perform essential job tasks 1, 2, 3, 4, 5, 7, 8, 9, and 13, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### 9.17.8.2 Physician Guidance.

**9.17.8.2.1** When evaluating the member for lung cancer, the physician shall consider that lung cancer compromises the member's ability to safely perform job tasks if low energy levels, anemia, undernutrition, weight loss, weakness, paraneoplastic syndromes, or specific organ dysfunction (abnormal secretions,



dyspnea, or pulmonary dysfunction interfering with or prohibiting use of SCBA or strenuous physical activities) are present.

**9.17.8.2.2** If treated successfully, the member shall undergo evaluation by a specialist who must certify that the member has normal function, imaging studies show no tumor, and overall medical evaluation reveals no condition that might compromise safe performance of essential job tasks.

#### **9.17.9 Gastrointestinal Malignancies.**

**9.17.9.1** Gastrointestinal malignancies might compromise the member's ability to safely perform essential job tasks 1, 3, 4, 5, 7, 8, and 9, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.17.9.2 Physician Guidance.**

**9.17.9.2.1** When evaluating the member for gastrointestinal malignancies, the physician shall consider that gastrointestinal malignancies compromise the member's ability to safely perform job tasks if low energy levels, anemia, undernutrition, weight loss, weakness, paraneoplastic syndromes, or specific organ dysfunction (abnormal secretions or bowel function interfering with or prohibiting prolonged use of personal protective clothing or prohibiting strenuous physical activities) are present.

**9.17.9.2.2** If treated successfully, the member shall undergo evaluation by a specialist who must certify that exam and gastrointestinal functioning appear to be normal (including nutrition intake and excretion), imaging studies show no tumor, and overall medical evaluation reveals no condition that could compromise safe performance of essential job tasks.

#### **9.17.10 Genitourinary Malignancies.**

**9.17.10.1** Physician Evaluation. Genitourinary malignancies might compromise the member's ability to safely perform essential job tasks 1, 3, 4, 5, 7, 8, and 9, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.17.10.2 Physician Guidance.**

**9.17.10.2.1** When evaluating the member with a history of genitourinary malignancy, the physician shall consider that genitourinary malignancies compromise the member's ability to safely perform job tasks if altered urinary function prevents prolonged activity without use of toilet facilities or if the underlying tumor has produced low energy levels, anemia, undernutrition, weight loss, or specific organ dysfunction.

**9.17.10.2.2** If treated successfully, the member shall undergo evaluation by a specialist who must certify that exam is normal (including nutrition intake and excretion), imaging studies show no tumor, and overall medical evaluation reveals no condition that might compromise safe performance of essential job tasks.

#### **9.17.11 Hematologic or Lymphatic Malignancies.**

**9.17.11.1** Physician Evaluation. Hematologic or lymphatic malignancies might compromise the member's ability to safely perform essential job tasks 1, 2, 3, 4, 5, 7, 8, and 9, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.17.11.2 Physician Guidance.**

**9.17.11.2.1** When evaluating the member for hematologic or lymphatic malignancies, the physician shall consider that hematologic or lymphatic malignancies (e.g., leukemias, lymphomas) compromise the member's ability to safely perform essential job tasks 1, 2, 3, 4, 5, 7, 8, and 9 if anemia, lymphopenia, or thrombocytopenia is present or if adverse effects of treatment are present.

**9.17.11.2.2** If treated successfully, the member shall undergo evaluation by a specialist who must certify that exam is normal, imaging and laboratory studies show no cancer, and overall medical evaluation reveals no condition that could compromise safe performance of essential job tasks.

#### **9.17.12 Skin Cancer.**

**9.17.12.1** Physician Evaluation. Skin cancer might compromise the member's ability to safely perform essential job tasks 1, 3, 4, 5, 7, 8, and 9, and after further evaluation and a final medical determination of the member's condition, the physician shall report any applicable job limitations to the fire department.

#### **9.17.12.2 Physician Guidance.**

**9.17.12.2.1** When evaluating the member for skin cancer, the physician shall consider that skin cancer that requires significant resection, chemotherapy or other systemic anti-neoplastic therapy, or that results in the loss of skin integrity, compromises the member's ability to safely perform job tasks because of low energy levels, anemia, undernutrition, and weight loss, as well as increased risk of burns, infection, dehydration, and heat rash while fire fighting and wearing PPE.

**9.17.12.2.2** If treated successfully, the member shall undergo evaluation by a specialist who must certify that exam is normal, imaging and laboratory studies show no cancer, and overall medical evaluation reveals no condition that could compromise safe performance of essential job tasks.

#### **9.18 Pregnancy and Reproductive Health.**

**9.18.1** Fire Departments shall make available to all male and female fire fighters educational materials outlining the risks from fire fighting on reproductive health.

**9.18.2** \* It is recommended that members who become pregnant report the pregnancy immediately to the fire department physician. Once informed of the pregnancy the fire department physician shall inform the pregnant member of the numerous hazards to the pregnancy and the fetus encountered during routine fire fighting tasks.

**9.18.2.1** If the member requests an alternative duty assignment in an environment deemed safe for the pregnancy and the fetus, the physician shall provide appropriate restrictions for essential job tasks 1, 3, 5, 6, 7, and 8 that are unsafe for her or her fetus.

**9.18.3** During later stages of pregnancy the member will eventually be unable to safely perform essential job tasks 1, 2, 3, 4, 5, 6, 7, 8, and 9 due to issues with diminished aerobic capacity, balance, speed, and agility. As with any other member, when performance due to medical issues is of concern, the AHJ shall inform the fire department physician and a medical evaluation will be performed to determine the need for restricting the member from those activities that they are not able to safely perform.



## 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.1.1.1** Some of the medical requirements in this standard are not applicable to candidates and members whose essential job tasks within the fire department are not described in NFPA 1001, NFPA 1002, NFPA 1003, NFPA 1006, NFPA 1021, and NFPA 1051. However, particular attention must be paid to the essential job tasks of individual candidates or members when applying this standard (for example, administrative staff personnel, some EMS personnel, fire/police, and others who do not have responsibility for structural fire fighting and are not required to wear personal protective ensembles and use SCBA). Medical requirements should reflect essential job tasks, and all might not be specifically addressed in this standard. (See also Chapter 5 and Chapter 9.)

**A.1.2.2** A direct relationship exists between the medical requirements and the job description of members. The job description should include all essential job functions of members, both emergency and nonemergency. Members perform a variety of emergency operations including fire fighting, emergency medical care, hazardous materials mitigation, driving/operating fire apparatus, and special operations. Nonemergency duties can include, but are not limited to, training, station and vehicle maintenance, and physical fitness. Each fire department needs to identify and develop a written job description for members.

**A.1.3.2** The specific determination of the authority having jurisdiction depends on the mechanism under which this standard is adopted and enforced. Where this standard is adopted voluntarily by a particular fire department for its own use, the authority having jurisdiction should be the fire chief or the political entity that is responsible for the operation of the fire department. Where this standard is legally adopted and enforced by a body having regulatory authority over a fire department, such as federal, state, or local government or political subdivision, this body is responsible for making those determinations as the authority having jurisdiction. The compliance program should take into account the services the fire department is required to provide, the financial resources available to the fire department, the availability of personnel, the availability of trainers, and such other factors as will affect the fire department's ability to achieve compliance.

**A.1.3.3** The most vital resource of any fire department is its members. This standard is to be implemented in a process aimed at improving member health and wellness. Due to the hazardous nature of the occupation, methods to reduce the risk of occupational injury, illness, and exposures to communicable diseases are warranted. Annual reports repeatedly indicate over 100 line-of-duty deaths and 100,000 occupational injuries and illnesses among career and volunteer fire fighters. Another concern is the fire fighters who experience disabling injuries or develop occupational diseases and conditions, which often have debilitating or fatal results, forcing them to leave their fire service activities. There is an increased risk of respiratory and heart disease in fire fighters and strong evidence of a link to some cancers and other conditions related to occupational exposures to carcinogens, toxic products of combustion, and hazardous materials.

Safety and health are two of the many components of the risk management process. The intent of this standard is to reduce the risk and burden of fire service occupational morbidity and mortality while improving the welfare of fire fighters. By implementing the medical requirements of this standard, a fire department commits to a process that evaluates and enhances the health and fitness for duty of members.

**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.3.3.1 Candidate.** Volunteer members are considered employees in some states or jurisdictions. Volunteer fire departments should seek legal counsel as to their legal responsibilities in these matters.

**A.3.3.17 Member.** A fire department member can be a full-time or part-time employee or a paid or unpaid volunteer, can occupy any position or rank within the fire department, and can engage in emergency operations. [1500, 2013]

**A.4.1.2.1** Fire departments can require candidates to provide some form of medical clearance for candidate participation in pre-employment physical strength and agility tests. When there is such a requirement, the medical clearance forms should enumerate the tasks that the candidate will be asked to safely perform during the test.

**A.4.1.4** This physician should also have experience with running an occupational medicine program for public safety workers, preferably fire fighters.

**A.4.1.7** The fire department should provide the fire department physician with a representative list of essential job tasks for members of fire departments who wear personal protective ensembles and SCBA to conduct interior structural fire-fighting operations. The tasks on this list should be verified by the fire department to be essential to the job under consideration for each individual candidate or member. A sample list based on NFPA 1001, NFPA 1002, NFPA 1003, NFPA 1006,

NFPA 1021, and NFPA 1051 is provided in 5.1.1 and Section 9.1. An effective way to transmit this information to the physician is to use the list with checkboxes in front of each essential job task. This list is taken by a candidate or member to the medical provider at the time of medical evaluation. A check in the box indicates that there is no medical reason why an individual cannot safely perform that particular essential job task.

**A.4.1.13.1** Suggested fields (data points) include but are not necessarily limited to the following:

- (1) Medical history including the following:
  - (a) Date of exam
  - (b) Medical history
  - (c) Smoking history
  - (d) Tobacco (smokeless) use
  - (e) Smoking in the past year
  - (f) Tobacco cessation program participation
  - (g) Alcohol use
  - (h) Family history of heart disease or cancer
  - (i) Personal history of past disease, disorders, or cancer
  - (j) Exercise history
- (2) Current medical and fitness results including the following:
  - (a) Blood pressure and heart rate
  - (b) ICD9 codes for physician assessment
  - (c) Height and weight
  - (d) Body composition (local recording only)
  - (e) Blood analysis results
  - (f) Urinalysis results
  - (g) Vision
  - (h) Hearing
  - (i) Spirometry
  - (j) Chest x-ray
  - (k) Resting electrocardiogram
  - (l) Cancer screening results
  - (m) Immunizations
  - (n) Aerobic capacity results
  - (o) Muscle strength results
  - (p) Muscle endurance results
  - (q) Flexibility results

**A.4.2.6** Incident scene rehabilitation is an important component of incident scene management that protects the health and safety of fire department members. NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program* and NFPA 1561, *Standard on Emergency Services Incident Management System*, require the establishment of “rehab” during incident scene operations. A significant component of member rehabilitation is ongoing medical evaluation. The standard does not require the fire department physician to be at every incident but does require that the physician coordinate with the EMS medical director to provide protocols for medical evaluation and management of members in emergency incident rehab. This medical planning process ensures optimal medical support for members at the scene and should include criteria for transportation to a medical facility for additional evaluation and treatment. Fire departments can develop specific standard operating procedures establishing conditions under which fire department physician(s) are dispatched to emergency incidents. (See NFPA 1584, *Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises*.)

**A.4.4.1** Confidentiality of all medical data is critical to the success of the program. Members need to feel assured that the information provided to the physician will not be inappropriately shared.

**A.5.1.1(1)** A member, while wearing full protective clothing (turnout coat and pants, helmet, boots, and gloves) and SCBA, is required to safely perform a variety of fire-fighting tasks that require upper body strength and aerobic capacity. For those not familiar with fire suppression, the following specific details inherent to the activities in essential job task 1 are offered:

- (1) Lifting and carrying tools and equipment (e.g., axe, halligan tool, pike pole, chain saw, circular saw, rabbit tool, high-rise pack, and hose) that weigh between 7 lb and 20 lb (3.2 kg and 9 kg) and are used in a chopping motion over the head, extended in front of the body, or in a push/pull motion.
- (2) Advancing a 1½ in. (45 mm) or a 2½ in. (65 mm) diameter hose line, which requires lifting, carrying, and pulling the hose at grade, below or above grade, or up ladders. In addition to the weight of the hose itself, a 50 ft (15 m) section of charged 1½ in. (45 mm) hose contains approximately 90 lb (41 kg) of water, and a 50 ft (15 m) section of 2½ in. (65 mm) hose holds approximately 130 lb (59 kg) of water.
- (3) Performing forcible entry while utilizing tools and equipment (e.g., axe, halligan tool, chain saw, circular saw, or rabbit tool) that requires chopping, pulling, or operating these items to open doors, windows, or other barriers to gain access to victims or possible victims or to initiate fire-fighting operations.
- (4) Performing ventilation (horizontal or vertical) utilizing tools and equipment (e.g., axe, circular saw, chain saw, pike pole) while operating on a flat or pitched roof or operating off a ground or aerial ladder. This task requires the fire fighter to chop or push tools through roofs, walls, or windows.

Other tasks that could be performed can include search and rescue operations and other emergency response actions under stressful conditions, including working in extremely hot and cold environments for prolonged time periods.

**A.6.1.1** The medical history should include the candidate's known health problems, such as major illnesses, surgeries, medication use, and allergies. Symptom review is also important for detecting early signs of illness. A medical history should also include a personal health history, a family health history, a health habit history, an immunization history, and a reproductive history.

An occupational history should also be obtained to collect information about the person's past occupational and environmental exposures.

**A.6.1.2** Physical examination should include the following:

- (1) Vital signs (temperature, pulse, respiratory rate, and blood pressure (BP))
  - (a) BP should be measured according to the seven recommendations of the *Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure* (JNC 7). BP should be measured with a properly calibrated and validated instrument. Patients should be seated quietly for at least 5 minutes in a chair with their feet on the floor and the arm supported at heart level. An appropriate-sized cuff (cuff bladder encircling at least 80 percent of the arm) should be used to ensure accuracy. At least two measurements should be made. Systolic BP is the point at which the first of two or more sounds is heard (phase 1), and diastolic BP is the point before the disappearance of sounds (phase 5). [Chobanian et al. 2003]
- (2) Head, eyes, ears, nose, and throat





- (3) Neck
- (4) Cardiovascular
- (5) Pulmonary
- (6) Breast
- (7) Gastrointestinal (includes rectal exam for mass, occult blood)
- (8) Genitourinary (includes pap smear, testicular exam, rectal exam for prostate mass)
- (9) Hernia
- (10) Lymph nodes
- (11) Neurological
- (12) Musculoskeletal
- (13) Skin (includes screening for cancers)
- (14) Vision testing

Laboratory tests on candidates should include the following:

- (1) Blood tests, including the following:
  - (a) CBC with differential, RBC indices and morphology, and platelet count
  - (b) Electrolytes (Na, K, Cl, HCO<sub>3</sub>, or CO<sub>2</sub>)
  - (c) Renal function (BUN, creatinine)
  - (d) Glucose
  - (e) Liver function tests (ALT, AST, direct and indirect bilirubin, alkaline phosphatase)
  - (f) Total cholesterol, HDL, LDL, clinically useful lipid ratios (e.g., percent LDL), and triglycerides
- (2) Urinalysis. Dipstick test for glucose, ketones, leukocyte esterase, protein, blood, and bilirubin.
- (3) Audiology. Hearing assessed in each ear at each of the following frequencies: 500 Hz, 1000 Hz, 2000 Hz, 3000 Hz, 4000 Hz, 6000 Hz, and 8000 Hz. Results should be corrected for age as permitted by OSHA. Baseline audiometry is performed in accordance with 29 CFR 1910.95, "Occupational noise exposure." The basics of this standard include the following:
  - (a) The first audiogram (for members, this will probably be done during their pre-placement exam) is the baseline audiogram.
  - (b) If subsequent audiograms are better than the baseline, then the best one becomes the baseline. All audiograms should be done with no exposure to industrial noise for the preceding 14 hours.
- (4) Spirometry. Pulmonary function testing (spirometry) is conducted to measure the member's forced vital capacity (FVC), forced expiratory volume in 1 second (FEV<sub>1</sub>), and the absolute FEV<sub>1</sub>/FVC ratio. FEV<sub>1</sub> and FVC results shall be expressed as the absolute value (liters or milliliters) and as percent predicted adjusted for gender, age, height, and ethnicity using NHANES III normative equations, with the acceptable threshold being 80 percent predicted. FEV<sub>1</sub>/FVC ratio results are expressed as the absolute FEV<sub>1</sub> value divided by the absolute FVC value, with the acceptable threshold value being 0.71. However, because these norms are population based, it is possible for individuals to be normal just below these thresholds or to have minimal but potentially significant abnormalities just above these thresholds. When percent predicted FEV<sub>1</sub> or FVC values are minimally below threshold (typically 74 percent to 79 percent of predicted), the lower limits of normal (LLN) for the appropriate population can, at the discretion of the physician, be used instead of the 80 percent predicted threshold value. For example, the LLN might be more appropriate for taller and older individuals. (See F.2.5.)
- (5) Chest radiography. Chest x-ray posterior-anterior and lateral views.
- (6) Electrocardiograms (ECG). A resting 12-lead ECG.
- (7) Immunizations and infectious disease screening. The following infectious disease immunizations or infectious disease screenings are to be provided, as indicated:
  - (a) Tuberculosis screen, purified protein derivative (PPD) tuberculin skin test, or blood test.
  - (b) Hepatitis C virus screen (baseline)
  - (c) Hepatitis B virus vaccinations
  - (d) Tetanus, diphtheria, pertussis (TDAP) vaccine (booster every 10 years)
  - (e) Measles, mumps, rubella (MMR) vaccine
  - (f) Polio vaccine given to uniformed personnel if vaccination or disease is not documented
  - (g) Hepatitis A vaccine due to contaminated water exposures during normal firefighting activities, not just hazmat/rescue activities
  - (h) Varicella vaccine, offered to all nonimmune personnel
  - (i) Influenza vaccine, seasonal and novel, offered to all personnel

A.6.3.1.2(1) Deformities of the skull can result in the member's inability to properly wear protective equipment.

A.6.3.1.2(2) These deformities can result in the potential for sudden incapacitation, the inability to properly wear protective equipment, and the inability to communicate effectively due to oropharyngeal dysfunction.

A.6.3.1.2(3) Loss of or congenital absence of the bony substance of the skull can result in the inability to properly wear protective equipment and the inability to communicate effectively due to oropharyngeal dysfunction.

A.6.3.2.2(1) Thoracic outlet syndrome can result in frequent episodes of pain or inability to safely perform work.

A.6.3.2.2(2) Congenital cysts, chronic draining fistulas, or similar lesions can result in the inability to properly wear protective equipment and the inability to communicate effectively due to oropharyngeal dysfunction.

A.6.3.2.2(3) The contraction of neck muscles can result in the inability to properly wear protective equipment and the inability to safely perform functions as a member due to limitation of flexibility.

A.6.4.1(1) Far visual acuity is at least 20/30 binocular, corrected with contact lenses or spectacles. Far visual acuity uncorrected is at least 20/40 binocular for wearers of hard contacts or spectacles. Successful long-term soft contact lens wearers (i.e., 6 months without a problem) are not subject to the uncorrected standard. Inadequate far visual acuity can result in the failure to be able to read placards and street signs or to see and respond to imminently hazardous situations.

A.6.4.1(2) This does not refer to abnormal color perception such as red/green color blindness.

Persons with severe color vision loss will likely fail the acuity requirement. Formerly, color vision deficiency was listed as a Category B medical condition. However, it is felt that within most cases this condition will not affect the ability of a member to safely perform the essential functions of his or her job. The fire service physician should consider the color vision deficiency of the individual and consider the color vision requirements of the member's job and reach an individual determination.



**A.6.4.1(3)** A DOT/CDL exemption can be applied for after passing a special test. But this exemption is not applicable to fire fighters because this exemption specifically excludes the driving of vehicles with passengers (e.g., fire trucks) and does not apply to emergency response driving.

**A.6.4.2(1)** These diseases of the eye can result in the failure to read placards and street signs or to see and respond to imminently hazardous situations.

**A.6.4.2(2)** Sufficient time (approximately 2 weeks for radial keratotomy and Lasik-type surgeries, and 3 months for retinal detachment) must have passed to allow stabilization of visual acuity and to ensure that there are no post-surgical complications. These ophthalmological procedures can result in the failure to be able to read placards and street signs or to see and respond to imminently hazardous situations.

**A.6.5** Currently, no hearing tests will allow the fire department physician to accurately predict whether the fire fighter will adequately be able to safely perform essential job duties. Job-specific hearing tests should be individualized for each department and its specific job functions. The following list of hearing-specific tasks can assist to direct development of hearing protocols:

- (1) Understanding spoken commands, both over the radio and while wearing SCBA
- (2) Hearing alarm signals, including building evacuation, low air alarm on the SCBA, and PASS alarms
- (3) Hearing and locating the source of calls for assistance from victims or other fire fighters

All of these tasks will need to be performed with reasonably simulated incident scene background noise and SCBA noise. The inability to hear sounds of low intensity or to distinguish voice from background noise can lead to failure to respond to imminently hazardous situations. (*See 5.1.1.*)

**A.6.5.1(4)** See A.9.12.4.1(4).

**A.6.5.2(1)** Unequal hearing can result in the inability to localize sounds, leading to failure in the ability to safely perform search and rescue and other localization tasks.

**A.6.5.2(4)** Severe external otitis — that is, recurrent loss of hearing — can result in the inability to hear sounds of low intensity or to distinguish voice from background noise, leading to failure to respond to imminently hazardous situations.

**A.6.5.2(5)** Severe agenesis or traumatic deformity of the auricle can result in the inability to properly wear protective equipment and the inability to hear sounds of low intensity or to distinguish voice from background noise, leading to failure to respond to imminently hazardous situations.

**A.6.5.2(6)** Severe mastoiditis or surgical deformity of the mastoid can result in the inability to properly wear protective equipment and the inability to hear sounds of low intensity or to distinguish voice from background noise, leading to failure to respond to imminently hazardous situations.

**A.6.5.2(7)** Ménière's syndrome or severe labyrinthitis can result in the potential for sudden incapacitation and the inability to safely perform job functions due to limitations of balance.

**A.6.5.2(8)** Otitis media (chronic) can result in frequent episodes of pain and the inability to hear sounds of low intensity or to distinguish voice from background noise, leading to failure to respond to imminently hazardous situations.

**A.6.6.2(1)** Diseases of the jaws or associated tissues can result in the inability to communicate effectively and/or to properly wear protective equipment.

**A.6.6.2(2)** The wearing of orthodontic appliances can result in the inability to communicate effectively and/or to properly wear protective equipment.

**A.6.6.2(3)** Extensive loss of oral tissues can result in the inability to properly wear protective equipment and the inability to communicate effectively due to oropharyngeal dysfunction.

**A.6.6.2(4)** This condition can result in the inability to properly wear protective equipment and the inability to communicate effectively due to oropharyngeal dysfunction.

**A.6.7.1(1)** A tracheostomy results in the inability to properly wear protective equipment, the inability to safely perform job functions due to limitations of endurance, and the inability to communicate effectively due to oropharyngeal dysfunction.

**A.6.7.1(2)** Aphonia can result in the inability to communicate effectively due to oropharyngeal dysfunction.

**A.6.7.2(1)** A congenital or acquired deformity can result in the inability to properly wear protective equipment.

**A.6.7.2(2)** Allergic rhinitis can result in frequent episodes of pain, the inability to safely perform work, and the inability to safely perform essential job tasks due to limitations of endurance.

**A.6.7.2(4)** Recurrent sinusitis can result in frequent episodes of pain and the inability to safely perform essential job tasks due to limitations of endurance and the inability to safely wear SCBA from facial pain, sinus congestion and/or coughing.

**A.6.7.2(5)** Severe dysphonia can result in the inability to communicate effectively due to oropharyngeal dysfunction.

**A.6.7.2(9)** Untreated obstructive sleep apnea is associated with fatigue, cognitive defects, pulmonary hypertension, hypertrophic heart disease, arrhythmias, and early onset dementia. These issues can reduce the ability to perform all essential job tasks. Risk factors for developing obstructive sleep apnea include male gender, increased body mass index (BMI), short/wide neck, and/or narrow throat. Screening questionnaires, such as the Berlin Questionnaire (assessing snoring, fatigue, obesity, and hypertension) can be used to determine those who require formal sleep testing. In those with obstructive sleep apnea, additional testing is required to determine the level of positive pressure (CPAP or BIPAP) required to overcome the obstruction. Compliance with treatment can be assessed using home monitoring devices attached to the CPAP or BIPAP machine. Target organ damage can be screened for by cardiac echo for evidence of pulmonary hypertension or right ventricular hypertrophy.

**A.6.8.1(5)** An FVC or FEV<sub>1</sub> of less than 70 percent prevents the safe use of SCBA due to increased minute ventilation requirements leading to the earlier than expected depletion of air in the SCBA cylinder.

**A.6.8.1(6)** Chronic obstructive airways disease can result in the inability to safely perform essential job tasks due to limitations of endurance and the inability to safely wear SCBA. Obstruction is suspected when the absolute FEV<sub>1</sub>/FVC ratio (using absolute values rather than percent predicted values) is equal to or less than 0.70. However, obstruction can also occur with normal FEV<sub>1</sub>/FVC ratios due to airtrapping or mucous plugging. For most individuals, the definition of an abnormal FEV<sub>1</sub> or FVC is less than 80 percent predicted adjusted for gender, age, height, and ethnicity, using NHANES III. When



percent predicted FEV<sub>1</sub> or FVC values are just below threshold (typically 74 percent to 79 percent of predicted), the LLN for the appropriate population can, at the discretion of the physician, be used. For example, the LLN might be more appropriate for taller and older individuals. In asymptomatic individuals with minimal reductions in spirometry measures (FEV<sub>1</sub>, FVC, or the absolute FEV<sub>1</sub>/FVC ratio), further evaluation (complete pulmonary function tests, exercise testing, or challenge testing) might be necessary to determine if essential tasks can be performed safely (see references in Annex F).

**A.6.8.1(7)** Hypoxemic disorders can result in the inability to safely perform essential job tasks due to limitations of endurance.

**A.6.8.1(8)** The term *asthma*, or *reactive airways dysfunction syndrome*, is not meant to include acute, nonrecurring bronchitis treated with bronchodilators for a period of only days to weeks. Recurrent or persistent allergic, irritant, exertional, or other forms of asthma are included. Bronchial asthma or reactive airways disease can result in frequent unpredictable episodes of shortness of breath and the potential for sudden incapacitation, leading to the inability to safely perform essential job tasks due to limitations of endurance. Acute hyperreactivity in the fire or hazardous materials environment can induce immediate or progressive clinical asthma (bronchospasm and wheeze), which can lead to sudden incapacitation from status asthmaticus and/or resulting cardiac ischemia. True asthma is a chronic condition with a clinical history of recurrent reversible bronchospasm or long-standing, persistent reversible bronchospasm. Based on the pathophysiology of this disease, it is reasonable that exposure to smoke irritants or exertion (especially while breathing cold dry SCBA air) on the fire ground or hazardous materials environment not only can lead to acute exacerbations but can also worsen the progression of the underlying obstructive inflammatory disease. If this occurs in an environment that is immediately dangerous to life and health (IDLH) (e.g., interior fire suppression or certain hazardous material operations), it can have potentially devastating consequences for the member, the team, or the mission. There are no studies that support or deny that asthma in this environment can be prevented or adequately controlled by anti-inflammatory medications (inhaled corticosteroids, cromolyn, leukotriene modifiers). It is not acceptable to use or rely on bronchodilator medications for this purpose for three reasons:

- (1) Their use is for rescue after attack and not for prevention of bronchospasm in an irritant environment.
- (2) There are no studies that support or deny that their use is effective in a fire/smoke environment.
- (3) Several studies have implicated the use of beta-agonists (short- and long-acting bronchodilators) as an independent risk for sudden death and myocardial infarction in the United States, Canada, Britain, New Zealand, and Australia. The presumed mechanism is catecholamine related, and catecholamines are already elevated while fighting fires.

**A.6.8.1.1** Because the clinical definition of asthma is reversible bronchospasm, spirometry, or pulmonary function, testing performed in the absence of a clinical attack is expected to be normal and might not even show a bronchodilator response. Only if performed during an attack will spirometry or other pulmonary function tests show obstructive airway flow limitations. Therefore, in candidates who report that their bronchospasm was temporary and has resolved, spirometry should show adequate reserve (FVC and FEV<sub>1</sub> greater than or equal to 90 percent predicted) without significant bronchodilator response (less than 12 per-

cent change and less than 200 mL increase) when performed off bronchodilators on the day of testing. For population studies, pulmonary function is considered normal when greater than or equal to 80 percent predicted, but for an individual with a history of asthmatic bronchospasm who is being considered for job tasks performed in a potentially irritant environment, it is reasonable diligence to require pulmonary function with a greater specificity for demonstrating adequate reserve (greater than or equal to 90 percent predicted). Challenge testing should also be performed to show no evidence for clinically significant airway hyperreactivity [i.e., to be normal or negative, there should be less than 20 percent decline in FEV<sub>1</sub> from baseline with cold air, methacholine (PC<sub>20</sub> greater than 8 is considered normal since response at dose greater than 8 mg might not be clinically significant), histamine, or mannitol. When challenge testing includes exercise alone, normal or negative should be less than 13 percent decline in FEV<sub>1</sub> from baseline]. Challenge testing should be performed off all anti-inflammatory medications (steroids and leukotriene antagonists) for 4 weeks preceding the test, off antihistamines for 1 week preceding the test, and off all bronchodilators the day of testing. Challenge testing should be performed only by an experienced specialist. It should not be performed in candidates without a history suggestive of asthma, since there is no indication for testing. It also should never be performed in candidates with abnormal pulmonary function, because these candidates have already demonstrated that they cannot safely perform essential job tasks, and further testing might induce life-threatening bronchospasm. Normal spirometry with adequate reserve, a negative challenge test [as described by the American Thoracic Society (ATS)], and no recent episode of bronchospasm off medications should be considered evidence that the candidate does not have clinically significant airway hyperactivity or asthma.

**A.6.8.2(1)** These conditions can result in the inability to safely perform essential job tasks due to limitations of strength or endurance and can result in the potential for sudden incapacitation.

**A.6.8.2(3)** Fibrothorax, chest wall deformity, and diaphragm abnormalities can result in the inability to safely perform essential job tasks due to limitations of endurance.

**A.6.8.2(4)** Interstitial lung diseases can result in the inability to safely perform essential job tasks due to limitations of endurance.

**A.6.8.2(5)** Pulmonary vascular diseases and pulmonary embolism can result in frequent episodes of pain and the inability to safely perform essential job tasks due to limitations of endurance and the potential for sudden incapacitation.

**A.6.8.2(6)** Bronchiectasis can result in the inability to safely perform essential job tasks due to limitations of endurance and frequent respiratory infections.

**A.6.9.1** An evaluation of aerobic capacity should be performed after appropriate medical evaluation. Testing should be conducted using an appropriate maximal or submaximal protocol (e.g., see C.2.1 and C.2.1.1). Bicycle ergometry is not appropriate because it underestimates true aerobic capacity. A low aerobic capacity can be an indicator of, and is a risk factor for, ischemic heart disease. For fire fighting, 12 METs or greater is necessary based on several studies.

**A.6.10.1.1(1)** Angina pectoris can result in frequent episodes of pain or the inability to safely perform essential job tasks,

progressive illness leading to functional impairment, and the potential for sudden incapacitation.

**A.6.10.1.1(2)** Heart failure can result in frequent episodes of pain or the inability to safely perform work, progressive illness leading to functional impairment, and the potential for sudden incapacitation.

**A.6.10.1.1(3)** These conditions can result in frequent episodes of pain or the inability to safely perform essential job tasks.

**A.6.10.1.1(4)** Recurrent syncope can result in the potential for sudden incapacitation.

**A.6.10.1.1(5)** A medical condition requiring an automatic implantable cardiac defibrillator can result in the potential for sudden incapacitation.

**A.6.10.1.1(7)** If the person is pacemaker-dependent, then the risk for sudden failure due to trauma is not acceptable. Those with cardiac pacemakers can have the potential for sudden incapacitation.

**A.6.10.1.2(1)** Specific recommendations include the following:

- (1) *Mitral stenosis*. Mitral stenosis is acceptable if in sinus rhythm and stenosis is mild — that is, valve area is greater than 1.5 cm<sup>2</sup> or pulmonary artery systolic pressure is less than 35 mm Hg.
- (2) *Mitral insufficiency*. Mitral insufficiency is acceptable if in sinus rhythm with normal left ventricular size and function.
- (3) *Aortic stenosis*. Aortic stenosis is acceptable if stenosis is mild — that is, mean aortic valvular pressure gradient is less than 20 mm Hg.
- (4) *Aortic regurgitation*. Aortic regurgitation is acceptable if left ventricular size is normal or slightly increased and systolic function is normal.
- (5) *Prosthetic valves*. Prosthetic valves are acceptable unless anticoagulation is in effect.

**A.6.10.1.2(2)** Recurrent paroxysmal tachycardia can result in the potential for sudden incapacitation and the inability to safely perform essential job tasks due to limitations of strength or endurance.

**A.6.10.1.2(3)** These blocks will result in disqualification unless exercise can be performed with an adequate heart rate response. They can result in the inability to safely perform essential job tasks, and have the potential for sudden incapacitation.

**A.6.10.1.2(6)** Ventricular ectopy or nonsustained ventricular tachycardia can result in sudden incapacitation and the inability to safely perform job functions due to limitations of strength or endurance. Medical clearance requires the following:

- (1) An echocardiograph that shows normal function and no evidence of structural abnormalities
- (2) Stress testing with imaging to a workload of at least 12 METs off cardiac medications that shows no evidence of ischemia, ventricular tachycardia, or ventricular fibrillation. Premature ventricular contractions (PVCs) should resolve with increasing levels of exercise.

**A.6.10.1.2(7)** Hypertrophy of the heart can result in the potential for sudden incapacitation and the inability to safely perform essential job tasks due to limitations of endurance.

**A.6.10.1.2(8)** A history of a congenital abnormality that has been treated by surgery but with residual complications or that has not been treated by surgery, leaving residuals or complications, can result in frequent episodes of pain or the inability to safely perform essential job tasks and the potential for sudden incapacitation.

**A.6.10.1.2(9)** These conditions can result in the inability to safely perform job functions due to limitations of endurance.

**A.6.10.2.1(1)(a)** Uncontrolled or poorly controlled hypertension increases the risk of a sudden cardiac or cerebrovascular event. A sudden cardiac or cerebrovascular event would cause sudden incapacitation, which would interfere with the safe performance of essential job tasks. Uncontrolled or poorly controlled hypertension can be defined as the presence of end organ damage [see A.6.10.2.1(1)(b)] or stage 2 hypertension (BP systolic >160 mm Hg or BP diastolic >100 mm Hg). Individuals with stage 1 or stage 2 hypertension should be referred to their primary care physician for evaluation, lifestyle modification, and/or treatment. Patients with prehypertension should be counseled about appropriate lifestyle modification(s). After appropriate and successful management of stage 1 or stage 2 hypertension, a candidate can be re-evaluated after at least 1 month's time.

**A.6.10.2.1(1)(b)** Chronic hypertension can damage the eye (retinopathy), the kidneys (nephropathy), the vascular system (stroke, transient ischemic attack, peripheral artery disease), and the heart (left ventricular hypertrophy, heart failure). These hypertension complications are known as end organ damage. The cardiac and vascular complications are associated with an increased risk of sudden incapacitation and sudden cardiac death (Koren et al. 1991). Unfortunately, cardiac complications are frequently asymptomatic, and valid screening tests are not fast or inexpensive. Therefore, determining which candidates to screen for cardiac complications [such as ECG for left ventricular hypertrophy (LVH) or a measurement of left ventricular ejection fraction for heart failure] should be based on the severity and the duration of hypertension.

**A.6.10.2.1(2)** An aneurysm of the heart or major vessel, congenital or acquired, can result in the inability to safely perform essential job tasks and the potential for sudden incapacitation.

**A.6.10.2.1(4)** Peripheral vascular disease can impair sensation, can increase the likelihood of injury, and can result in frequent episodes of pain or the inability to safely perform essential job tasks due to limitations of endurance.

**A.6.10.2.2(2)** Recurrent thrombophlebitis can result in frequent episodes of pain or the inability to safely perform essential job tasks and the inability to safely perform functions as a member due to limitations of endurance.

**A.6.10.2.2(3)** Chronic lymphedema can result in the inability to safely perform essential job tasks due to limitations of endurance.

**A.6.10.2.2(4)** Congenital or acquired lesions of the aorta or major vessels — for example, syphilitic aortitis, demonstrable atherosclerosis that interferes with circulation, and congenital acquired dilatation of the aorta — can result in the potential for sudden incapacitation and the inability to safely perform essential job tasks due to limitations of endurance.

**A.6.10.2.2(5)** Marked circulatory instability can result in the inability to safely perform job functions due to limitations of





endurance and the inability to safely perform essential job tasks due to limitations of balance.

**A.6.11.2(1)** Cholecystitis (that which causes frequent pain due to stones or infection) can result in frequent episodes of pain and the inability to safely perform essential job tasks.

**A.6.11.2(2)** Gastritis (that which causes recurrent pain and impairment) can result in frequent episodes of pain and the inability to safely perform essential job tasks.

**A.6.11.2(3)** GI bleeding can cause fatigue and/or hemodynamic instability resulting in the inability to safely perform essential job tasks.

**A.6.11.2(4)** Acute hepatitis (until resolution of acute hepatitis as determined by clinical examination and appropriate laboratory testing) can result in frequent episodes of pain and the inability to safely perform essential job tasks.

**A.6.11.2(5)(c)** The member should be evaluated for persistent abnormality causing increased risk of infection and/or strangulation.

**A.6.11.2(6)** Inflammatory bowel disease (that which causes disabling pain or diarrhea) can result in frequent episodes of pain and the inability to safely perform essential job tasks. It is a progressive illness leading to functional impairment.

**A.6.11.2(7)** Intestinal obstruction (that is, recent obstruction with impairment) can result in frequent episodes of pain, the inability to safely perform essential job tasks, and the potential for sudden incapacitation.

**A.6.11.2(8)** Pancreatitis (chronic or recurrent) can result in frequent episodes of pain and the inability to safely perform essential job tasks.

**A.6.11.2(10)** A bowel resection (if frequent diarrhea precludes performance of duty) can result in frequent episodes of pain and the inability to safely perform essential job tasks.

**A.6.11.2(11)** A gastrointestinal ulcer (where symptoms are uncontrolled by drugs or surgery) can result in frequent episodes of pain and the inability to safely perform essential job tasks.

**A.6.11.2(12)** The member should be evaluated for underlying disease, history of trauma, or associated infections.

**A.6.11.2(13)** Cirrhosis, hepatic or biliary (that which is symptomatic or in danger of bleeding), can result in frequent episodes of pain and the inability to safely perform essential job tasks.

**A.6.11.2(14)** Chronic active hepatitis can result in weakness, general malaise, and the inability to safely perform essential job tasks.

**A.6.12.1** Metabolic syndrome includes three or more of the following components:

- (1) Abdominal obesity, defined as a waist circumference >40 in. (>102 cm) in men, >35 in. (>88 cm) in women
- (2) Triglycerides > 150 mg/dl
- (3) HDL cholesterol < 40 mg/dl for men, < 50 mg/dl for women
- (4) Blood pressure > 135/85 mmHg
- (5) Fasting blood glucose > 110 mg/dl.

Metabolic syndrome is associated with reduced aerobic capacity that interferes with the ability to safely train to be a fire fighter and to safely perform essential job tasks 2, 4, 5, 6, 7, 8, 9, 10, and 13. Metabolic syndrome is also an increased risk for

cardiovascular disease, hypertension, and insulin resistant hyperglycemia.

**A.6.13.2(1)** Heavy physical exertion has been associated with spontaneous abortions. Lifting heavy objects should be avoided during pregnancy. Excessive heat, toxic chemicals and catecholamine surges have the potential for fetal harm.

**A.6.16.2(1)** The member should be evaluated for residual instability (subluxation) or significant limitation of motion.

**A.6.16.2(4)** The member should be evaluated for residual instability or laxity of ligament or intra-articular arthritis, which could cause instability in limb, inadequate range of motion, or increased pain or would limit crawling, kneeling, jumping, safe ladder use, or safe stretcher carrying.

**A.6.16.2(5)** The member should be evaluated for residual signs or symptoms (e.g., pain, swelling, atrophy, range of motion, gait).

**A.6.16.2(6)** The member should be evaluated for resulting functional impairment, disease activity, and chronicity.

**A.6.17.1(4)** The candidate should be free of clinical disease for 3 years, a neurologic exam should be normal, and the candidate should not require drugs that can impair ability to safely perform essential job tasks. In considering performance of essential job tasks, the impact of the operational environment (e.g., heat, stress, activity, variable night shifts) on exacerbations should be considered and specifically addressed by a neurological specialist so that an informed determination can be made by the fire department's medical officer.

**A.6.17.1(5)** The candidate should be free of clinical disease for 3 years and off all drug and other treatment. Cognitive function, neurologic exam, and respiratory status should all be normal, and the candidate should be free of disease exacerbations for 3 years and off all drug treatment.

**A.6.17.2(2)** Exam and imaging studies should be normal, and medications needed to control chronic pain should not affect neurologic or cardiac function (energy, cognitive ability, equilibrium, etc.). Examples include the following:

- (1) Neuropathy (cranial, peripheral, plexus, etc.). Motor and sensory neurologic exams and diagnostic/imaging studies (as needed) should be normal, and medications needed to control pain should not affect nervous system function (energy, cognitive ability, equilibrium, etc.).
- (2) Myopathy and/or myositis. Motor strength is normal, pain is controlled without narcotics, renal function is normal, and neither heart nor diaphragm is involved.
- (3) History of infectious myoneuropathies (e.g., Guillain-Barré, post-botulism, post-polio syndrome). Cognitive function, neurologic exam, and diagnostic imaging studies (as needed) should be normal.

**A.6.18.2(1)** The candidate should be evaluated for severity, chronicity, pain, likelihood of serious occupational infectious exposure, requirement for continuous medication, and impairment of ability to safely perform essential job tasks.

**A.6.18.2(2)** The candidate should be evaluated for thinned, stretched skin that is at risk for easy breakdown, burn damage, abnormal sensations, or infection.

**A.6.18.2(3)** The candidate should be evaluated for systemic involvement, skin involvement that interferes with essential job tasks, or presence of localized complications such as fissures, weeping, or ulcerations, due to risk of burn injury and/or infection.



**A.6.18.2(4)** The candidate should be evaluated for associated systemic lupus, skin integrity, and Raynaud's phenomenon.

**A.6.18.2(5)** The candidate should be evaluated for functional limitation of hand and/or foot when exposed to cold or systemic involvement of skin, muscles, heart, lungs, or neurologic system that would compromise the safe performance of essential job tasks.

**A.6.18.2(6)** The candidate should be evaluated for sclerodactyly with significant loss of function or systemic involvement.

**A.6.18.2(7)** The candidate should be evaluated for associated leg swelling, loss of function, or systemic involvement.

**A.6.18.2(8)** The candidate should be evaluated for percent body involvement with redness and scaling, requirement for regular application of lubrication/medication, and/or potential effect on safe performance of essential job tasks.

**A.6.18.2(9)** The candidate should be evaluated for extent, severity, chronicity, and known precipitants with attention to potential risk of serious, occupational infectious exposures or other interference with safe performance of essential job tasks.

**A.6.18.2(10)** The candidate should be evaluated for swelling, redness, scaling, itching, weeping, and/or cracking, pain, loss of function (e.g., cannot stand for long periods of time), or ulceration.

**A.6.18.2(11)** The candidate should be evaluated for functional limitations, ability to wear helmet, SCBA other respirators required by the AHJ with proper fit-testing, and protective clothing, and requirements for continuous treatment.

**A.6.18.2(12)** The candidate should be evaluated for extent, chronicity, and interference with safe performance of essential job tasks.

**A.6.18.2(13)** The candidate should be evaluated for extent, chronicity, pain, ability to wear protective ensemble, and risk of occupational infectious exposure.

**A.6.18.2(14)** The candidate should be evaluated for extent and acuity of blistering, loss of function, aggravating agent(s) if known, ability to wear protective ensemble, ability to tolerate moderate, incidental, job-related trauma to skin, risk of occupational infectious exposure, or inability to safely perform essential job tasks.

**A.6.18.2(15)** The candidate should be evaluated for severity, chronicity, association with underlying medical condition, and requirement for medications (antihistamines) that interfere with the ability to safely perform essential job tasks.

**A.6.20.1(1)** Type 1 diabetes was previously called insulin-dependent diabetes mellitus (IDDM) or juvenile-onset diabetes. Type 1 diabetes develops when the body's immune system destroys pancreatic beta cells, the only cells in the body that make the hormone insulin, which regulates blood glucose. This form of diabetes usually strikes children and young adults, although disease onset can occur at any age. Type 1 diabetes accounts for 5 percent to 10 percent of all diagnosed cases of diabetes. In order to survive, people with Type 1 diabetes must have insulin delivered by a pump or injections.

Type 2 diabetes was previously called non-insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes. Type 2 diabetes accounts for about 90 percent to 95 percent of all diagnosed cases of diabetes. It usually begins as insulin resistance, a disorder in which the cells do not use insulin properly. As the need for

insulin rises, the pancreas gradually loses its ability to produce insulin. Type 2 diabetes is associated with older age, obesity, family history of diabetes, prior history of gestational diabetes, impaired glucose tolerance, physical inactivity, and race/ethnicity. Type 2 diabetes is increasingly being diagnosed in children and adolescents. Many people with Type 2 diabetes control their blood glucose by following a careful diet and exercise program, losing excess weight, and taking oral medication. Among adults with diagnosed diabetes, about 12 percent take both insulin and oral medications, 19 percent take insulin only, 53 percent take oral medications only, and 15 percent do not take either insulin or oral medications.

Risk of hypoglycemia (low blood sugar) remains the major concern in regard to those with diabetes being or becoming fire fighters. This risk is greatest in those with Type 1 diabetes.

In general, patients treated with oral diabetes medications are at little risk of significant hypoglycemia. Patients treated with metformin, alpha-glucosidase inhibitors, or thiazolidinediones alone or in combination with each other are at no risk of hypoglycemia, as these classes of drug do not increase insulin levels. Patients treated with sulfonylureas and related drugs have a risk of severe hypoglycemia less than 1 percent of the risk associated with insulin treatment. Patients treated with diet and exercise alone (no oral diabetes medications or insulin) are at no risk of hypoglycemia.

Fire fighting entails a unique set of conditions that need to be considered in regard to those with diabetes and the risks of hypoglycemia. Unpredictable meal schedules, periods of physical exertion, adrenergic stimulation, and sleep deprivation all present challenges to fire fighters with diabetes. There are occasions when there is no safe access to food or other forms of oral glucose while wearing respiratory protection in a hazardous environment, and the typical symptoms of hypoglycemia might not be recognized as easily in the midst of fighting a fire. As well, it is not always possible to exit a hazard zone rapidly enough to treat hypoglycemic symptoms when detected. Members engaged in fire suppression are at greater risk than those engaged in other emergency activities (EMS, law enforcement) for this reason.

A review of current published data suggests that with careful individualized assessment it is possible to identify those with diabetes who can function fully as fire fighters and who do not present a significant risk to themselves, their fellow fire fighters, or to those they serve.

The individualized assessment process and criteria included in this standard were set up to assure that only those who are managing their diabetes conscientiously using the most up-to-date approaches would be eligible to be a fire fighter. In addition, certain patients have a greater tendency for significant hypoglycemia despite the quality of their diabetes management. Such individuals are not good candidates to be fire fighters and, accordingly, are excluded from service under the criteria in this standard.

This individualized assessment is possible in large part because a great deal of change has occurred in the treatment of diabetes in recent years. Previously patients used insulins that were somewhat unpredictable in the time course of their action and generally took two injections per day. Today, there are insulins that are far more predictable and are either very long acting and essentially treat only endogenous glucose production (and therefore do not depend on a patient eating on a regular schedule) or are very rapid and therefore can be administered directly before, during, or even shortly after one eats, significantly de-



creasing the chance of insulin being taken and then the meal being interrupted due to fire-fighting duties.

Regimens now referred to as “basal bolus” are composed of a very long-acting basal (or background) insulin, which controls glucose levels overnight and in the absence of glucose intake, and rapid-acting (bolus) insulins that are dosed just prior to, during, or even after meals based on blood glucose levels at that time, the amount of carbohydrate that the person expects to consume, and any anticipated change in physical activity patterns over the next number of hours.

These regimens have resulted in improved overall blood glucose control with significantly less risk of hypoglycemia for many patients.

Additional major advances in the size, speed, and sophistication of blood glucose meters provide for easy, accurate, and rapid assessment of blood glucose levels. Such monitoring techniques, as well as the generally increased self-awareness that accompanies consistent self-monitoring, enable the motivated fire fighter with diabetes to assess blood glucose levels and ingest a safety net of carbohydrates before entering a hazardous environment. Similarly, major advances in insulin delivery systems have greatly increased the ability of the motivated individual with diabetes to achieve a level of diabetes self-management consistent with the duties of fire fighting.

In order to get maximum effect from medical advances and to minimize the risk of hypoglycemia, patients with diabetes must check their blood glucose level frequently (as recommended based on factors such as type of therapy and glycemic history), review those results on a regular basis, and see their diabetes care provider regularly for discussion in regard to any necessary changes in treatment. Patient evaluation needs to look for any of the known risk factors for serious hypoglycemia or evidence of any of the known microvascular (eye disease, kidney disease, or nerve disease) or macrovascular (cardiovascular disease, peripheral arterial disease) complications of diabetes. A 12 MET stress test is required because myocardial infarction remains the major cause of line-of-duty fatalities, and diabetes is a risk factor for myocardial ischemia, especially asymptomatic silent myocardial ischemia.

The individualized assessment described previously demands a very close and good working relationship between the patient and the diabetes care provider. The experience of those who care for current fire fighters with diabetes is that many are highly motivated and will do whatever it takes to perform their jobs at a high level and in a safe manner.

Recognizing that there is variability in the relationship between the hemoglobin A1C and the 3-month average blood glucose, we recommend that hemoglobin A1C levels greater than the 8 percent threshold in Sections 6 and 9 be confirmed by a second determination before action is taken.

The physician evaluating an individual with a hemoglobin A1C > 8 percent should consider a discordance between the A1C and the 3-month average glucose if any of the following conditions exists:

- (1) A repeated value is below the threshold.
- (2) A single A1C determination is discordant with prior or subsequent determinations with no other evidence of deterioration in glycemic control.
- (3) The patient's reported capillary blood glucose determinations and/or venous glucose determinations in the physician's office are significantly lower than those reflected by the estimated average glucose (eAG) (eAG calculator available at <http://professional.diabetes.org/glucosecalculator.aspx>).

- (4) The patient has a personal or family history or other evidence of a hemoglobinopathy.
- (5) The patient is a member of an ethnic group with increased risk of hemoglobinopathy.

If the evaluating physician suspects that the A1C overestimates average blood glucose, further evaluation can include the following:

- (1) Repeat HbA1C
- (2) Prior HbA1C values
- (3) Serum fructosamine determination
- (4) Downloaded reports from a memory glucometer
- (5) Downloaded reports from a 72-hour continuous glucose monitor
- (6) Downloaded reports from a personal continuous glucose monitoring device

Possible explanations for discordance between the eAG based on A1C and the patient's true average glucose include the following:

- (1) *Assay Precision.* The American College of Pathology accepts variation within 7 percent in A1C assays. Thus, a person with an A1C of 8 percent might have a value between 7.5 percent and 8.5 percent on repeat testing of the same sample. [Cohen 2010]
- (2) *Hemoglobinopathies.* According to the National Diabetes Information Clearinghouse (NDIC): “With some assay methods, A1C tests in patients with hemoglobinopathies result in falsely high outcomes, overestimating actual average blood glucose levels for the previous 2 to 3 months. Physicians may then prescribe more aggressive treatments, resulting in increased episodes of hypoglycemia. Some assay methods used with some hemoglobinopathies may result in falsely low outcomes, leading to undertreatment of diabetes.” Also according to the NDIC: “About one in 12 African Americans has sickle cell trait. About 14.7 percent of African Americans aged 20 years or older have diabetes. Therefore, many African Americans have both diabetes and sickle cell trait.... People of Southeast Asian descent are at risk for having hemoglobin E (HbE), another hemoglobin variant.”
- (3) *Interindividual Variation.*
- (4) *Clinical Studies.* A comparison of HbA1C with average glucose derived from 2 days of continuous monitoring and 3 months of 7 point glucose profiles at least three times a week. The confidence interval for average glucose with an A1C of 8 percent was 147–217 mg/dl. [Nathan 2008]
- (5) *RBC Lifespan:* Hemoglobin A1C levels are a “snapshot” of what is truly a rolling average. Subclinical variation in RBC lifespan can have a significant effect on the relationship between mean glucose and A1C, with increases in average RBC lifespan increasing net glycosylation and decreases (as in some hemoglobinopathies or in recovery from hemorrhage or anemia) decreasing net glycosylation. [Herman and Cohen 2010, Cohen 2008]
- (6) *RBC Glucose Transport.* Variations in transport across the RBC membrane result in different intracellular and extracellular glucose levels, thus affecting intracellular hemoglobin exposure to glucose and resultant glycosylation. [Khera 2008]
- (7) *Variations in Glycosylation Rates.* Patients vary in activity of the glycosylation reaction; genetically determined “high” and “low” rates of glycosylation have been described in a number of studies, explaining about one-third of interindividual variation in A1C levels. [Hudson 1999, Snieder 2001, Hempe 2002, Cohen 2006, Soranzo 2010]

- (8) *Interethnic Variation.* Numerous studies have identified the effect of ethnicity on the relationship between average glucose and A1C. In general, Caucasians have significantly lower A1C levels at comparable glucose. [Herman 2007, Cohen 2007, Viberti 2006, Herman 2009, Ziemer 2010, Kirk 2006]. This variability is independent of the effect of hemoglobinopathies noted in (2).

A.6.20.1(1)(g)iv. Episodes of severe hypoglycemia are associated with an increased risk of subsequent episodes. Hypoglycemia can interfere with cognitive function and judgment. Presence of microvascular and neurological complications of diabetes can increase the risk of hypoglycemic events.

A.6.20.1(2)(g)iv. Episodes of severe hypoglycemia might predict an increased risk of subsequent episodes. Hypoglycemia can interfere with cognitive function and judgment. Presence of microvascular and neurological complications of diabetes can increase the risk of hypoglycemic events.

A.6.20.2(1) The candidate should be evaluated for absence of orthostatic hypotension, electrolyte disorders, ability to maintain hydration during exercise under extreme environmental conditions, and normal thyroxine levels with supplementation.

A.6.21.2(2) Previous burn injury per se does not interfere with the essential job tasks of fire fighting. Extensive burn injury with or without the need for skin grafting can result in skin surfaces that are easily damaged, sensitive to chemical or solvent exposure, or lacking in sweat or sebaceous glands. The candidate should be evaluated for heat or cold intolerance, range of motion and motor strength, and ability to wear personal protective clothing and equipment.

A.6.22.2(1) The candidate should be evaluated for space-occupying lesion, treatment, or sequelae affecting ability to perform essential job tasks.

A.6.22.2(2) The candidate should be evaluated for history or risk of seizure; residual effects on balance, coordination, strength, speech, judgment; and medication requirements.

A.6.22.2(3) The candidate should be evaluated for ability to wear SCBA and maintain nutrition and oral hydration.

A.6.22.2(4) The candidate should be evaluated for residual pulmonary function and medication requirements.

A.6.22.2(5) The candidate should be evaluated for abnormal bowel or urinary function that would interfere with emergency operations where toilet facilities are unavailable, the ability to maintain nutrition and hydration, and medication requirements.

A.6.22.2(6) The candidate should be evaluated for muscle strength, deformity interfering with function, or the ability to wear protective ensemble.

A.6.22.2(7) The candidate should be evaluated for anemia, leukopenia, or thrombocytopenia, or residual cardiac, pulmonary, GI, dermatological, or neurological effects of surgery, radiation, or chemotherapy.

A.6.24.1(5) Leukotriene receptor antagonists are not Category A condition if used to treat conditions not affecting the lower respiratory system.

A.6.24.2 The candidate should be evaluated for an underlying condition requiring the medication and effects of medica-

tion that could affect ability to safely perform essential job tasks.

A.7.1.3 A department should set protocols regarding length of time absent from duty and/or medical conditions that require the department physician to evaluate a member. Physical therapy, strength training, work hardening, functional capacity evaluations, and alternate duty are all activities that can be helpful.

A.7.2.2(5) Universal agreement exists that wellness, fitness, and risk reduction for cardiovascular disease, pulmonary disease, and cancer can be reduced by tobacco abstinence, regular exercise, and control of weight, hypertension, cholesterol, and blood sugar. The annual medical evaluation should serve as one of many opportunities in the fire department to modify these risk factors. Clearly, risk reduction is easier if there is early intervention and if the department promotes wellness and fitness. Tobacco cessation programs should be available to the member, and all fire department facilities should be tobacco-free zones. Control of weight, hypertension, cholesterol, and blood sugar are all improved with dietary education and regular exercise.

A.7.7.1 If performing these tests as part of an automated panel that includes additional tests is more cost-effective, it is acceptable to do so.

A.7.7.4.1 Pulmonary spirometry is an essential part of the annual medical evaluation of fire fighters wearing personal protective clothing and SCBA. Spirometric measures include the forced vital capacity (FVC), the forced expiratory volume in the first second of expiration (FEV<sub>1</sub>), and the absolute FEV<sub>1</sub>/FVC ratio calculated by dividing the FEV<sub>1</sub> by the FVC in liters. Other spirometric measures of small airway flow limitations [e.g., forced expiratory flow (FEF) 25 percent to 75 percent] should not be used for screening evaluations. For spirometric measurements to be properly interpreted, they need to be performed according to American Thoracic Society recommendations. Modern spirometry uses computer-assisted quality control of both calibration and testing procedures. FEV<sub>1</sub> and FVC results are expressed not only as absolute values (liters) but also as percent predicted adjusted for gender, age, height, and ethnicity. Currently, the preferred method uses NHANES III normative equations with the acceptable threshold being 80 percent predicted. When percent predicted FEV<sub>1</sub> or FVC values are minimally below threshold (typically 74 percent to 79 percent of predicted), the LLN for the appropriate population can, at the discretion of the physician, be used instead of the 80 percent predicted threshold value. For example, the LLN may be more appropriate for taller and older individuals. (See references in F.2.5.) However, because these norms are population-based, it is possible for individuals to be normal just below these thresholds or to have minimal but potentially significant abnormalities just above these thresholds. In asymptomatic individuals with minimal reductions in spirometry measures (FEV<sub>1</sub>, FVC, or the absolute FEV<sub>1</sub>/FVC ratio), further evaluation (complete pulmonary function tests, exercise testing, or challenge testing) can be necessary to determine if essential tasks can be performed safely. Such tests are not screening tests and therefore should be performed in a laboratory setting by an experienced specialist.

A.7.7.4.3 When the FVC or FEV<sub>1</sub> is reduced below 70 percent of predicted, substantial dysfunction is present. Moderate chronic obstructive pulmonary disease is considered to be present when the absolute FEV<sub>1</sub>/FVC ratio is equal to or less





than 0.70 and the FEV<sub>1</sub> is less than 70 percent predicted. Severe chronic obstructive pulmonary disease is considered to be present when the absolute FEV<sub>1</sub>/FVC ratio is less than 0.70 and the FEV<sub>1</sub> is less than 30 percent predicted. Moderate to severe restriction is considered when the FVC is less than 60 percent predicted with an absolute FEV<sub>1</sub>/FVC ratio greater than 0.90. Again, in certain cases, additional pulmonary function testing can be required, such as pre- and post-spirometry, lung volumes, diffusing capacity, exercise testing, and/or challenge testing. Because these tests are for diagnostic purposes, they should be performed in a laboratory setting by an experienced specialist. [Hankinson 1999]. For most individuals, the definition of an abnormal FEV<sub>1</sub> or FVC is less than 80 percent predicted adjusted for gender, age, height, and ethnicity using NHANES III. However, because these norms are population-based, it is possible for individuals to be normal just below these thresholds or to have minimal but potentially significant abnormalities just above these thresholds. When percent predicted FEV<sub>1</sub> or FVC values are just below threshold (typically 74 percent to 79 percent of predicted), the LLN for the appropriate population can, at the discretion of the physician, be used. For example, the LLN might be more appropriate for taller and older individuals. In asymptomatic individuals with minimal reductions in FEV<sub>1</sub> or FVC values (70 to 79 percent predicted) and a normal FEV<sub>1</sub>/FVC ratio (0.71 to 0.90), further evaluation (complete pulmonary function tests, exercise testing, or challenge testing) might be necessary to determine if essential tasks can be performed safely (see F.2.5).

**A.7.7.6.3** In asymptomatic individuals, no firm guidelines have been developed for stress testing (exercise test with ECG) for the screening of cardiac disease or the risk of sudden death. Risk stratification is useful in determining who should receive such testing.

Submaximal stress testing can be used for screening but not for diagnosis. Cardiology evaluation with symptom-limiting stress testing and imaging techniques (e.g., echocardiography, technetium Tc99m sestamibi study) should be used for assessing cardiovascular disease in the following individuals:

- (1) Fire fighters with positive or questionably positive changes on screening submaximal stress tests
- (2) Fire fighters with new-onset chest pain, symptoms suggestive of coronary artery disease (CAD), or known coronary artery disease
- (3) Fire fighters over the age of 45 (for men) and 55 (for women) with one or more of the following risk factors for CAD:
  - (a) Hypercholesterolemia (total cholesterol greater than 240 mg/dL)
  - (b) Hypertension (systolic > 140 mmHg or diastolic > 90 mmHg)
  - (c) Diabetes
  - (d) Smoking
  - (e) Family history of premature CAD (heart attack or sudden cardiac death in a first-degree relative less than 60 years of age)
- (4) Fire fighters with a Framingham Risk Score > 10% (risk calculator available at <http://hp2010.nhlbi.nih.net/atpiii/calculator.asp>)

Negative stress tests should be repeated as clinically indicated or at least every 2 to 5 years.

Interpreting stress tests as "positive" or "negative" is beyond the scope of this document. However, factors that should be

taken into consideration should include the individual's exercise capacity, symptoms, blood pressure response, heart rate response, ECG changes, and the presence of arrhythmias (Gibbon et al. 2002).

Among the other noninvasive tests to screen for CAD is coronary artery calcium (CAC) scoring by computed tomography. In 2007, an expert committee published an update to their original guidance document. The committee's consensus was that "it may be reasonable to consider use of CAC measurement in such patients with intermediate risk (between 10 percent and 20 percent 10-year risk of estimated coronary event)." The committee did not recommend CAC measurement in low-risk patients (less than 10 percent 10-year risk of estimated coronary event) or in high risk patients [greater than 20 percent 10-year risk of estimate coronary event] [Greenland et al. 2007]. High-risk individuals should be referred directly to stress imaging without the need for CAC scoring.

**A.7.7.8(1)** An annual TB program should include the following:

- (1) Documentation of a two-step purified protein derivative (PPD) tuberculin skin test prior to this PPD, a 0 mm PPD within the past year, or a negative TB blood test for interferon gamma release assay within the past year. [*Morbidity and Mortality Weekly Review*, December 16, 2005, and NFPA 1581, *Standard on Fire Department Infection Control Program*]
- (2) If the TB skin test (PPD) is used, the following is required:
  - (a) Placement of the PPD and subsequent reading by a trained, designated reader within 48 hours to 72 hours of placement. Members with a history of positive PPD should instead fill out a questionnaire and might be required to have a chest radiograph.
  - (b) PPD results should be documented in millimeters (mm). A test with no skin reaction should be recorded as 0 mm. PPD measurement should not include erythema and should include only induration in the axis perpendicular to the forearm.
  - (c) A PPD skin test will be considered positive if the following conditions are present:
    - i. 5 mm or greater in a member who is immunosuppressed, who has a household contact with active tuberculosis, or who has an abnormal chest radiograph consistent with prior tuberculosis
    - ii. 10 mm or greater in a member with a normal immune system who has an increased probability of recent infection or has other clinical conditions that increase the risk for progression to active TB. This includes all members, because fire fighters are considered health care workers if they perform EMS or rescue activities.
    - iii. 5 mm increase from previous reading occurring within last 2 years.
- (3) TB blood tests are now readily available. Their cost effectiveness must be judged by considering the fact that false positives from atypical mycobacterium or BCG vaccination do not occur and that this test requires only one visit for blood drawing, thus eliminating a return visit for PPD skin test reading. False positives and false negatives can occur if the blood specimens are not properly obtained, handled, and processed prior to and after arrival in the laboratory.



- (4) If the PPD or the tuberculin skin test is positive (conversion), the following steps should be taken:
  - (a) Member fills out questionnaire.
  - (b) Member obtains chest x-ray.
  - (c) Member is evaluated for active disease.
  - (d) Member is evaluated for preventative therapy.
- (5) If active disease is suspected, the member should be removed from any duty until he/she has been determined to be noninfectious. This will occur when the diagnosis of tuberculosis is ruled out or, if confirmed, when adequate therapy has been instituted, the cough has resolved, and three consecutive sputum smears for acid-fast bacillus (AFB) on different days are negative.

In the event of an exposure to TB, the following steps should be taken:

- (1) Member without a recent PPD (in the last 6 months) should receive a PPD, tuberculin skin test, or TB blood test within 14 days of exposure. Members with a history of positive PPD, tuberculin skin test, or TB blood test, should fill out a TB questionnaire.
- (2) Another PPD, tuberculin skin test, or TB blood test and the questionnaire should be repeated 6 weeks to 12 weeks after the first PPD.
- (3) If the PPD skin test or TB blood test turns positive (conversion) or the questionnaire is positive, proceed as described in A.7.7.8(1)(5) and A.7.7.8(1)(6).

A.7.7.8.2 For further guidelines and requirements, refer to local and state departments of health and the Centers for Disease Control (CDC); also see the references in F.2.6.

A.7.7.9.2 The BBP protocol should include the following elements:

- (1) Fact sheet that explains in lay language the risks of infection, the various prophylactic and therapeutic options, the testing and follow-up that will be needed, and recommendations for personal behavior (safe sex, blood donation, etc.) following an exposure
- (2) Classification table to determine the exposure type and recommendation for prophylaxis
- (3) Current recommendations of the U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, and Public Health Services
- (4) List of tests to be done on exposed member, including the following:
  - (a) HIV
  - (b) Hepatitis B surface antibody (HBsAb), if not previously known to be positive
  - (c) Hepatitis B surface antigen (HBsAg), if not previously known to be positive
  - (d) Hepatitis C antibody (HCAb)
  - (e) If HIV prophylaxis is to be given, the following tests:
    - i. CBC
    - ii. Glucose, renal, and hepatic chemical function
    - iii. Pregnancy test for females
- (5) List of tests to be done on source patient, including the following:
  - (a) HIV
  - (b) HBsAg
  - (c) HCAb
- (6) If source is available, interview for HIV, hepatitis B, and hepatitis C risk/status

- (7) Determination of risk and need for post-exposure prophylaxis (PEP)
- (8) Member counseling regarding PEP medication(s) and side effects of treatment; a printed fact sheet for the member to review
- (9) PEP, if appropriate, given as soon as possible after the incident, preferably within 2 hours
- (10) Follow-up of members on prophylaxis for the duration of their treatment
- (11) Assessment of tetanus status and administration of dT booster, if appropriate
- (12) Assessment of hepatitis B status as follows:
  - (a) If previously immunized with a positive post-immunization titer, no further treatment is needed.
  - (b) If previously immunized, titer was negative, and source is HBsAg positive or high risk, give hepatitis B immune globulin (HBIG) as soon as possible, preferably within 24 hours, and give a dose of hepatitis B vaccine.
  - (c) If previously immunized and titer is unknown, draw titer and proceed as follows:
    - i. If titer is positive, no further treatment is needed.
    - ii. If titer is negative and source is HBsAg positive or high risk, then give HBIG as soon as possible, preferably within 24 hours, and give a dose of hepatitis B vaccine.
    - iii. If previously immunized with negative titer and revaccinated with a negative titer, give HBIG immediately and a second dose 1 month later.
    - iv. If never immunized, give HBIG and begin hepatitis B vaccine series.
- (13) Follow-up instructions should include the following information:
  - (a) Adverse events and side effects of PEP
  - (b) Signs and symptoms of retroviral illness (fever, adenopathy, rash)
  - (c) Appointments for follow-up blood work, including the following:
    - i. HIV at 6 weeks, 3 months, 6 months, and 9 months
    - ii. HBsAb and/or HCAb at 6 weeks, 3 months, and 6 months, if source is hepatitis B and/or hepatitis C positive
    - iii. Every other week CBC, renal, and liver function, if receiving PEP

A.7.7.13 Screening for prostate cancer in asymptomatic men using the PSA test is controversial; however, studies suggest that fire fighters have increased rates of prostate cancer. Therefore, prostate screening using the PSA is indicated. There is consensus regarding the serial measurements of PSA, known as the PSA velocity, for comparison over time. An increase over time indicates an increased risk for prostate cancer. A PSA test might detect small cancers that would never become life-threatening. It is unclear whether the benefits of PSA screening outweigh the risks of follow-up cancer tests and cancer treatments. Several noncancerous conditions might result in an elevated PSA level, including benign prostatic hypertrophy (BPH) and other conditions related to acute or chronic inflammation. When testing reveals an elevated PSA level, it is important that the benefits and risks of prostate diagnostic procedures and treatment be discussed with the member.



**A.8.1.1** Besides the methods of determination of body fat mentioned in 8.1.2, other, cruder methods have been used. Insurance companies have used height-weight tables to estimate risk of mortality. These tables of “ideal” weight for a given height simply reflect the norm for the U.S. population without consideration of relationship of the norm to health or fitness. Another means of determining obesity that has more scientific basis is the measurement of body mass index (BMI) or the Quetelet index. This is defined as body weight in kilograms divided by height in meters squared. Studies have shown that the Quetelet index correlates rather well ( $r = 0.70$ ) with actual measurement of body fat from hydrostatic weighing — better than do height-weight tables. BMI also correlates with risks associated with obesity. Some experts feel that the major limitation of the BMI is that it is difficult to interpret to patients and to use in counseling about weight loss. It does have the advantage of being more precise than weight tables and of permitting comparison of populations. However, skinfold measurements correlate more highly with data from hydrostatic weighing, measuring percent body fat, and are thus more accurate for fat-related classification than the Quetelet index. Researchers from the Panel on Energy, Obesity, and Body Weight Standards have recommended that Table A.8.1.1 be used when using the Quetelet index for obesity classification.

**Table A.8.1.1 Quetelet Index for Obesity**

BMI (kg/m <sup>2</sup> )	Classifications
20–24.9	Desirable range for men and women
25–29.9	Grade 1 obesity
30–40	Grade 2 obesity
Greater than 40	Grade 3 obesity (morbid obesity)

The health risks associated with obesity begin in the range of 25 kg/m<sup>2</sup> to 30 kg/m<sup>2</sup>. For example, someone with a large fat-free mass (e.g., a bodybuilder) would be classified by the Quetelet index as obese, though not to the same extent as he/she would be with relative weight or the height-weight tables. Another example of exception to this standard would be members of the Phoenix Fire Department, whose average BMI is 28. This would place the members in the mildly obese range, yet on their fitness evaluations they score in the excellent range.

**A.8.1.2(1)** A number of researchers have found that the ratio of waist-to-hip circumference (WHR) and the following circumference measurements are an accurate and convenient method of determining the type of obesity present:

- (1) Abdomen I (males) over the umbilicus
- (2) Abdomen II (females) just below the umbilicus, at the narrowest portion of the waistline below the ribs and above hips with the abdomen relaxed

The guide for measurement is as follows:

- (1) Hips at the widest part below the waist; landmark is the greater trochanter, feet together
- (2) Neck just below the larynx perpendicular to the long axis of the neck

Equations for body fat prediction from circumferences and height measured in inches are as follows:

Males ( $N = 592$ ;  $R = 90$ ; S.E. meas = 3.52 percent fat) percent fat =  $+ [85.20969 \times \log (\text{abdomen I circumference} - \text{neck circumference})] - [69.73016 \times \log (\text{height})] + 37.26673$

Females =  $+ [161.27327 \times \log (\text{abdomen II circumference} + \text{hip-neck circumference})] - [100.81032 \times \log (\text{height})] - 69.55016$

**A.8.1.2(3)** The most widely used method for determining obesity is based on the thickness of skinfolds. The measures, when performed correctly, have a high correlation ( $r = 0.80+$ ) with body density from underwater weighing.

Many researchers in the United States (including those performing the large national surveys of the U.S. population that form the basis for normative data worldwide) take skinfold measurements on the right side of the body. U.K. and European investigators, on the other hand, tend to take measurements on the left side of the body. Most research, however, reveals that it matters little on which side measurements are taken.

A suggested way to conduct measurements is as follows:

- (1) As a general rule, those with little experience in skinfold measurement should mark the site to be measured with a black felt pen. A flexible steel tape can be used with sites when it is necessary to locate a bodily midpoint. With experience, however, the sites can be located without marking.
- (2) The measurer should feel the site prior to measurement, to familiarize himself and the person being measured with the area where the skinfold will be taken.
- (3) The skinfold should be firmly grasped by the thumb and index finger of the left hand and pulled away from the body. While this is usually easy with thin people, it is much harder with the obese and can be somewhat uncomfortable for the person being tested. The amount of tissue pinched up must be enough to form a fold with approximately parallel sides. The thicker the fat layer under the skin, the wider the necessary fold (and the more separation needed between thumb and index finger).
- (4) The caliper is held in the right hand, perpendicular to the skinfold and with the skinfold dial facing up and easily readable. The caliper heads should be placed  $\frac{1}{4}$  in. to  $\frac{1}{2}$  in. away from the fingers holding the skinfold, so that the pressure of the caliper will not be affected.
- (5) The skinfold caliper should not be placed too deep into the skinfold or too far away on the tip of the skinfold. Try to visualize where a true double fold of skin thickness is and place the caliper heads there. It is good practice to position the caliper arms one at a time, first the fixed arm on one side and then the lever arm on the other.
- (6) The dial is read approximately 4 seconds after the pressure from your hand has been released on the lever arm of the caliper jaw.
- (7) A minimum of two measurements should be taken at each site. Measurements should be at least 15 seconds apart to allow the skinfold site to return to normal. If consecutive measurements vary by more than 1 mm, more should be taken until there is consistency.
- (8) Maintain the pressure with the thumb and forefinger throughout each measurement.
- (9) When measuring the obese, it can be impossible to elevate a skinfold with parallel sides, particularly over the abdomen. In this situation, try using both hands to pull the skinfold away while a partner attempts to measure the width. If the skinfold is too wide for the calipers, underwater weighing or another technique will have to be used.
- (10) Measurements should not be taken when the skin is moist because there is a tendency to grasp extra skin, obtaining

inaccurately large values. Also measurements should not be taken immediately after exercise or when the person being measured is overheated, because the shift of body fluid to the skin will inflate normal skinfold size.

- (11) It takes practice to be able to grasp the same amount of skinfold consistently at the same location every time. Accuracy can be tested by having several technicians take the same measurements and comparing results. It can take up to 20 to 50 practice sessions to become proficient. Calipers should be accurately calibrated and have constant pressure of 10 g/mm<sup>2</sup> throughout the full measurement range. The accuracy of skinfold measurements can be reduced by many factors, including measurement at the wrong sites, inconsistencies among different calipers and testers, and the use of inconsistent equations. However, when testers practice together and take care to standardize their testing procedures, inconsistencies among testers can usually be held under 1 percent.

**A.8.2.2.1** An appropriate target level should be to a predicted level of 12 METs or greater, which is necessary for firefighting activities.

**A.8.2.2.1.2** A prescribed aerobic program might be a consideration.

**A.9.1.3(1)** A member, while wearing full protective clothing (turnout coat and pants, helmet, boots, and gloves) and SCBA, is required to safely perform a variety of fire-fighting tasks that require upper body strength and aerobic capacity. For those not familiar with fire suppression, the following specific details inherent to the activities in essential job task 1 are offered:

- (1) Lifting and carrying tools and equipment (e.g., axe, halligan tool, pike pole, chain saw, circular saw, rabbit tool, high-rise pack, and hose) that weigh between 7 lb and 20 lb (3.2 kg and 9 kg) and are used in a chopping motion over the head, extended in front of the body, or in a push/pull motion.
- (2) Advancing a 1¾ in. (45 mm) or a 2½ in. (65 mm) diameter hose line, which requires lifting, carrying, and pulling the hose at grade, below or above grade, or up ladders. In addition to the weight of the hose itself, a 50 ft (15 m) section of charged 1¾ in. (45 mm) hose contains approximately 90 lb (41 kg) of water, and a 50 ft (15 m) section of 2½ in. (65 mm) hose holds approximately 130 lb (59 kg) of water.
- (3) Performing forcible entry while utilizing tools and equipment (e.g., axe, halligan tool, chain saw, circular saw, or rabbit tool) that requires chopping, pulling, or operating these items to open doors, windows, or other barriers to gain access to victims, possible victims, or to initiate fire-fighting operations.
- (4) Performing ventilation (horizontal or vertical) utilizing tools and equipment (e.g., axe, circular saw, chain saw, pike pole) while operating on a flat or pitched roof or operating off a ground or aerial ladder. This task requires the fire fighter to chop or push tools through roofs, walls, or windows.

Other tasks that could be performed can include search and rescue operations and other emergency response actions under stressful conditions, including working in extremely hot and cold environments for prolonged time periods.

**A.9.3.2** Possible accommodations include but are not limited to changes in assignment, provision of special devices to assist the member in accommodating the medical disability, revision of standard operating procedures, and/or techniques.

**A.9.3.3** What this chapter does is provide guidance to fire department physicians for determining a member's ability to medically and physically function using the individual medical assessment for the conditions listed in the chapter.

**A.9.4** Fire-fighting activities have a high static component (i.e., inducing predominantly an increase in blood pressure) and a moderate to high dynamic component (i.e., inducing predominantly an increase in heart rate). Sports with a similar set of demands include wrestling, body building, and boxing. Recommendations made by the task force with respect to athletic activities that have these physical demands (high static, moderate dynamic) have been followed in this document.

Performance of the aerobic and anaerobic critical job tasks in a stressful, noxious fire or rescue environment with low oxygen, high carbon monoxide, and numerous toxic gases has significant risk for acutely aggravating pre-existing arrhythmias and cardiac ischemia (oxygen delivery) and decreasing cardiac valve or muscle function (oxygen supply). To protect from this environment requires that the fire fighter wear personal protective equipment (PPE) and SCBA. The PPE provides a thermal barrier at the cost of added weight, encapsulation, dehydration, and increased metabolic cost for a given workload. The SCBA is a positive pressure demand valve respirator that provides a barrier against the inhalation of noxious/toxic gases and particulate matter but at increased metabolic cost due to its weight and increased respiratory workload. Fire-fighting activities have a high static component (i.e., inducing predominantly an increase in blood pressure) and a moderate to high dynamic component (i.e., inducing predominantly an increase in heart rate). These factors increase physiologic stress and cardiac demand and can precipitate acute cardiac collapse, heart attack, syncope (blackout), or sudden death. In the absence of sudden death, the fact that the fire fighter was operating in an isolated, dangerous environment when a cardiac event occurred would make the subsequent risk for such an event leading to death unacceptably high for that fire fighter, for the civilian who depends upon that fire fighter, or for other fire fighters who not only depend upon that fire fighter but can also be called upon to rescue that fire fighter.

**A.9.4.8.2(7)** Those without any of the above risk factors have a less than 1 percent risk of sudden death.

**A.9.4.9.1** A first episode of syncope must be fully evaluated to determine that the underlying cause does not compromise a member's ability to safely perform job tasks. Underlying neurologic, cardiovascular, circulatory, and/or endocrine disturbance must be ruled out. If after evaluation there is no evidence for underlying disease, exam is normal, and there has been no reoccurrence, then the member need not be restricted from performing job tasks. If underlying disease is present and not reversible, then the member's ability to safely perform essential job tasks 1, 4, 5, 7, 8, 9, and 13 is compromised due to risk for life-threatening sudden incapacitation. *(For additional recommendations, see section relevant to the underlying disease.)* If recurrent and no underlying disease, then the member's ability to safely perform essential job tasks 1, 4, 5, 7, 8, 9, and 13 might be compromised.

**A.9.4.10.1** This technology has not been FDA approved for operating effectively under conditions commonly found on the fire ground (electromagnetic interference). In addition, the requirement for pacemaker or implantable defibrillator defines the underlying cardiac condition as life-threatening. Many pacemakers do not have the ability to automatically in-





crease heart rate upon demand during the critical job tasks performed on the fire ground.

**A.9.4.16.1** Evaluation with ECG, Holter monitor, and/or stress test should be further supplemented with electrophysiologic study (EPS). If rapid supraventricular tachycardia is inducible and surgical ablation is successful, there is no medical reason to restrict the member from performing essential job task 13.

**A.9.4.17.1** Even if rate controlled (with or without medication), the added catecholamine stress and dehydration produced when performing critical job tasks on the fire ground makes the potential for life-threatening sudden incapacitation associated with this rhythm disturbance too great a risk. If persistent or recurrent, these arrhythmias, even if rate controlled, can result in embolic events, which prevent the successful and safe performance of critical job tasks on the fire ground or during emergency responses.

**A.9.4.20.1** Members with prehypertension (systolic 120–139 mmHg or diastolic 80–89 mmHg), Stage 1 hypertension (systolic 140–159 mmHg or diastolic 90–99 mmHg), or stage 2 hypertension (systolic 160 mmHg or greater or diastolic 100 mmHg or greater) should be referred to their primary care physician for evaluation, lifestyle modification, and/or treatment.

- (1) Members with stage I hypertension whose BP returns to either prehypertension or normal with lifestyle modification can return to an annual medical evaluation. For members with long-standing stage I hypertension whose BP has not been reduced, additional evaluation for possible end organ damage should be considered, including any or all of the following:
  - (a) Complete patient history for symptoms of heart failure (e.g., shortness of breath upon exertion) or transient ischemic attacks (TIAs)
  - (b) Dilated eye examination for retinopathy
  - (c) Blood creatinine measurement for nephropathy
  - (d) Tests for left ventricular hypertrophy (Use of the resting ECG to detect left ventricular hypertrophy is insensitive, e.g., 5 percent sensitivity, so echocardiogram is the currently accepted test for diagnosing left ventricular hypertrophy.)
- (2) Chronic hypertension can damage the eye (retinopathy), the kidneys (nephropathy), the vascular system (stroke, TIA, or PAD), or the heart (left ventricular hypertrophy and heart failure). These hypertension complications are known as end organ damage. The cardiac and vascular complications are associated with an increased risk of sudden incapacitation and sudden cardiac death (Koren et al. 1991). With proper evaluation, lifestyle modification, and/or treatment, these complications can be avoided. Lifestyle modification includes weight reduction, dietary plan, reduction in dietary sodium, an increase in aerobic physical activity, and moderation in alcohol consumption [Chobanian 2003].
- (3) Because of the high risk of a sudden cardiovascular events (e.g., due to undiagnosed cardiac disease), members with stage 2 hypertension should be restricted until their blood pressure can be brought under control. Once their blood pressure is brought under control, end stage organ complications should be regularly evaluated as described in A.9.4.20.1(2). The frequency of such evaluation is based on the severity and duration of their elevated blood pressure.

**A.9.4.21.1** Metabolic syndrome includes three or more of the following components:

- (1) Abdominal obesity, defined as a waist circumference > 102 cm (> 40 in.) in men or > 88 cm (> 35 in.) in women
- (2) Triglycerides > 150 mg/dl
- (3) HDL cholesterol < 40 mg/dl for men, < 50 mg/dl for women
- (4) Blood pressure > 135/85 mmHg
- (5) Fasting blood glucose > 110 mg/dl

Members with metabolic syndrome should receive a cardiac stress. Members should be counseled as to lifestyle adjustments, receive an exercise prescription, and be referred to their personal physician for treatment of their elevated cholesterol, triglycerides, insulin resistant hyperglycemia, and/or hypertension.

**A.9.6** All disorders of the hypothalamic-pituitary-adrenal axis can potentially affect fire fighters because these hormonal systems play an essential role in maintaining homeostasis when exposed to physiologic and emotional stress while performing critical tasks on the fire ground or during emergency operations. Homeostatic regulation is further impaired under conditions of extreme temperature and dehydration, both of which are common when performing the critical tasks of fire fighting while wearing personal protective clothing on the fire ground.

Without treatment, the risk of life-threatening dehydration, extreme alterations in body temperature, electrolyte disturbances, and muscle weakness while operating at a fire scene is unacceptably high. Mineralocorticoid deficiency also increases the risk of life-threatening hypotension and/or arrhythmias associated with exertion and dehydration. For this reason, untreated or uncorrected hypothalamic, hypopituitarism, hypothyroidism, hyperthyroidism, thyroid storm, hypoadrenalism, hyperadrenalism, parathyroidism, and other disorders of thyroid and adrenal function threaten a member's ability to safely perform essential job tasks.

**A.9.6.3.1** Type 1 diabetes was previously called insulin-dependent diabetes mellitus (IDDM) or juvenile-onset diabetes. Type 1 diabetes develops when the body's immune system destroys pancreatic beta cells, the only cells in the body that make the hormone insulin, which regulates blood glucose. This form of diabetes usually strikes children and young adults, although disease onset can occur at any age. Type 1 diabetes can account for 5 percent to 10 percent of all diagnosed cases of diabetes. In order to survive, people with Type 1 diabetes must have insulin delivered by a pump or injections.

Type 2 diabetes was previously called non-insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes. Type 2 diabetes can account for about 90 percent to 95 percent of all diagnosed cases of diabetes. It usually begins as insulin resistance, a disorder in which the cells do not use insulin properly. As the need for insulin rises, the pancreas gradually loses its ability to produce insulin. Type 2 diabetes is associated with older age, obesity, family history of diabetes, prior history of gestational diabetes, impaired glucose tolerance, physical inactivity, and race/ethnicity. Type 2 diabetes is increasingly being diagnosed in children and adolescents. Many people with Type 2 diabetes can control their blood glucose by following a careful diet and exercise program, losing excess weight, and taking oral medication. Among adults with diagnosed diabetes, about 12 percent take both insulin and oral medications, 19 percent take insulin only, 53 percent take oral medications only, and 15 percent do not take either insulin or oral medications.



Diabetic members should be carefully monitored for control of blood sugar because lack of glycemic control increases the risk for dehydration, hypotension, and target organ damage (e.g., myocardial infarction), which that can result in life-threatening sudden incapacitation during performance of critical job tasks. Such members should be monitored at regular intervals to ascertain that blood glucose and blood hemoglobin A1C levels remain under control. According to the American Diabetes Association 2010 guidelines, lowering hemoglobin A1C to below or around 7 percent has been shown to reduce microvascular and neuropathic complications of type I and type II diabetes. The recommendation for microvascular disease prevention in nonpregnant adults in general is for a hemoglobin A1C level of less than 7 percent. Exceptions to this 7 percent level would be any condition that exists in addition to diabetes that is responsible for the hemoglobin A1C not accurately reflecting average glucose levels (e.g., hemoglobinopathies such as sickle cell disease). Additional exceptions to this 7 level would occur in individuals already not meeting NFPA 1582 requirements (e.g., history of severe hypoglycemia or end organ complications). See reference in F.2.3.

With medical control of diabetes, the risk of hypoglycemia (low blood sugar) becomes a major concern in regard to those with diabetes being or becoming fire fighters. This risk is greatest in those with Type 1 diabetes.

In general, members treated with oral diabetes medications are at little risk of significant hypoglycemia. Members treated with metformin, alpha-glucosidase inhibitors, or thiazolidinediones alone or in combination with each other are at no risk of hypoglycemia, as these classes of drugs do not increase insulin levels. Members treated with sulfonylureas and related drugs have a risk of severe hypoglycemia less than 1 percent of the risk associated with insulin treatment. Members treated with diet and exercise alone (no oral diabetes medications or insulin) are at no risk of hypoglycemia.

Fire fighting entails a unique set of conditions that need to be considered in regard to those with diabetes and the risks of hypoglycemia. Unpredictable meal schedules, periods of physical exertion, adrenergic stimulation, and sleep deprivation all present challenges to fire fighters with diabetes. There are occasions when there is no safe access to food or other forms of oral glucose while wearing respiratory protection in a hazardous environment, and the typical symptoms of hypoglycemia might not be recognized as easily in the midst of fighting a fire. As well, it is not always possible to exit a hazard zone rapidly enough to treat hypoglycemic symptoms when detected. Members engaged in fire suppression are at greater risk than those engaged in other emergency activities (EMS, law enforcement) for this reason.

A review of current published data suggests that with careful individualized assessment it is possible to identify those with diabetes who can function fully as fire fighters and who do not present a significant risk to themselves, their fellow fire fighters, or to those they serve.

The individualized assessment process and criteria included in this standard were set up to assure that only those who are managing their diabetes conscientiously using the most up-to-date approaches would be eligible to be a fire fighter. In addition, certain patients have a greater tendency for significant hypoglycemia despite the quality of their diabetes management. Such individuals would not be good candidates to be fire fighters and, accordingly, are excluded from service under the criteria in this standard.

This individualized assessment is possible in large part because a great deal of change has occurred in the treatment of

diabetes in recent years. Previously, patients used insulins that were somewhat unpredictable in the time course of their action and generally took two injections per day. Today, there are insulins that are far more predictable and are either very long acting and essentially treat only endogenous glucose production (and therefore do not depend on a patient eating on a regular schedule) or are very rapid and therefore can be administered directly before, during, or even shortly after one eats, significantly decreasing the chance of insulin being taken and then the meal being interrupted due to fire fighting duties.

Regimens now referred to as “basal bolus” are composed of a very long-acting basal (or background) insulin, which controls glucose levels overnight and in the absence of glucose intake and rapid-acting (bolus) insulins that are dosed just prior to, during, or even after meals based on blood glucose levels at that time, the amount of carbohydrate that the person expects to consume, and any anticipated change in physical activity patterns over the next number of hours.

These regimens have resulted in improved overall blood glucose control with significantly less risk of hypoglycemia for many patients.

Additional major advances in the size, speed, and sophistication of blood glucose meters provide for easy, accurate, and rapid assessment of blood glucose levels. Such monitoring techniques, as well as the generally increased self-awareness that accompanies consistent self-monitoring, enable the motivated fire fighter with diabetes to assess blood glucose levels and ingest a safety net of carbohydrates before entering a hazardous environment. Similarly, major advances in insulin delivery systems have greatly increased the ability of the motivated individual with diabetes to achieve a level of diabetes self-management consistent with the duties of fire fighting.

In order to get maximum effect from these medical advances, and to minimize the risk of hypoglycemia, members with diabetes must check their blood glucose level frequently (as recommended based on factors such as type of therapy and glycemic history), review these results on a regular basis, and see their diabetes care provider regularly for discussion in regard to any necessary changes in treatment. Member evaluation needs to look for any of the known risk factors for serious hypoglycemia or evidence of any of the known microvascular (eye disease, kidney disease, or nerve disease) or macrovascular (cardiovascular disease, peripheral arterial disease) complications of diabetes. A 12 MET stress test is required because myocardial infarction remains the major cause of line-of-duty fatalities, and diabetes (Type 1 and Type 2) is not only a risk factor for myocardial ischemia but also for silent myocardial ischemia.

The individualized assessment just described demands a very close and good working relationship between the member and the diabetes care provider. The experience of those who care for current fire fighters with diabetes is that this works for a highly motivated member who will do whatever it takes to perform his/her job at a high level and in a safe manner.

#### A.9.6.4.1 See A.9.6.3.1.

**A.9.7** Theoretically, respiratory protection from this environment is afforded by SCBA use. Experience shows that SCBA are frequently taken off to improve visibility and that SCBA air supply is often insufficient to last for the entire fire operation (ingress, suppression, overhaul, and egress). Thus, performance of essential job tasks is regularly done for short time periods in a noxious fire or hazardous materials environment with high carbon monoxide, noxious/toxic gases, and irritants. Working in this environment has added potential for



increasing carbon monoxide levels, decreasing oxygen levels, and reducing oxygen delivery, and the extent of this reduction and resulting risk is directly related to the degree of dysfunctional gas exchange already present prior to the performance of these essential job tasks. It also has potential for acutely aggravating pre-existing airway hyperreactivity commonly found in patients with asthma and other obstructive pulmonary conditions (bronchitis, etc.). Acute hyperreactivity in this environment is likely to induce immediate clinical asthma (bronchospasm and wheeze) with a significant increased work of breathing and gas exchange abnormalities. Respiratory insufficiency, no matter the cause, has the potential for arrhythmias, cardiac ischemia (oxygen delivery), decreased respiratory and cardiac function (oxygen delivery to tissues), acidosis, and life-threatening sudden incapacitation.

**A.9.7.6** Asthma, defined as reversible bronchospasm, can be temporary or chronic. “Temporary asthma,” more accurately referred to as acute bronchitis with wheezing, is a brief episode lasting days to months, usually following allergic or infectious exposure. When this occurs without prior history, it most likely will resolve over the next few weeks or months. Such temporary incidents, once resolved, do not compromise the member’s ability to safely perform essential job tasks. In contrast, true asthma is a chronic condition with a clinical history of recurrent reversible bronchospasm or longstanding, persistent reversible bronchospasm. For asthmatics, exposure to smoke or other irritants on the fire ground or a hazardous materials environment has a high probability of causing acute asthma attacks and can also worsen the progression of the underlying obstructive inflammatory disease. If this occurs in an environment that is immediately dangerous to life and health (e.g., interior fire suppression or certain hazardous materials operations), it can have potentially devastating consequences for the member, the team, or the mission. There are no studies that support or deny that asthma in this environment can be prevented or adequately controlled by anti-inflammatory medications (inhaled corticosteroids, cromolyn, leukotriene modifiers). It is not acceptable to use or rely on bronchodilator medications for this purpose because in a hazardous environment, SCBA cannot be removed to use a rescue inhaler. There are no studies that support or deny that the use of such medications is preventive or effective in a fire/smoke environment, and several studies have implicated the use of beta-agonists (short- and long-acting bronchodilators) as an independent risk for sudden death and myocardial infarction in the United States, Canada, Britain, New Zealand, and Australia.

Identifying asthmatics who are not only stable in a normal environment but also do not have asthmatic attacks in a fire or irritant environment is difficult. Because the clinical definition of asthma is reversible bronchospasm, spirometry or pulmonary function testing performed in the absence of a clinical attack is expected to be normal and might not even show a bronchodilator response. Only if performed during an attack will spirometry or other pulmonary function tests show obstructive airway flow limitations with a positive bronchodilator response (greater than 12 percent and 200 mL increase in FEV<sub>1</sub>). Therefore, in these fire fighters who report good control without asthma exacerbations on the fire ground, spirometry should show adequate reserve (FVC and FEV<sub>1</sub> greater than or equal to 90 percent predicted), without significant bronchodilator response when performed off bronchodilators on the day of testing. For population studies, pulmonary function is considered normal when greater than or equal to

80 percent predicted, but for an individual with a history of asthmatic bronchospasm who is being considered for job tasks performed in a potentially irritant environment, it is reasonable diligence to require pulmonary function with a greater specificity for demonstrating adequate reserve (greater than or equal to 90 percent predicted). The first time this member is being evaluated for asthma control, challenge testing should be performed to demonstrate no evidence for clinically significant airway hyperreactivity [i.e., to be normal or negative there should be less than 20 percent decline in FEV<sub>1</sub> with provocative challenge testing to cold air, exercise (12 METs), or a methacholine (PC<sub>20</sub> greater than 8 is considered normal, as response at dose greater than 8 mg might not be clinically significant)]. Challenge testing should be performed off bronchodilators the day of testing. If the member reports good control only when taking prescribed control medications (inhaled corticosteroids, cromolyn, or leukotriene modifiers), then consideration should be given to continuing these medications during the testing. The member should not use bronchodilators (short- or long-acting bronchodilators) the day of testing because these medications could undermine the purpose of this test — that is, demonstrating normal pulmonary function without clinically significant bronchodilator response or airway hyperreactivity. Challenge testing should be performed only by an experienced specialist. Testing should not be performed in members without a history suggestive of asthma, since there is no indication for testing. It should never be performed in members with moderate to severe pulmonary dysfunction, as these members have already demonstrated that they cannot safely perform essential job tasks, and further testing might induce life-threatening bronchospasm. Challenge testing should not be performed annually and should be repeated only if clinically indicated.

**A.9.7.6.1(7)** If the member reports good control only when taking prescribed control anti-inflammatory medications (e.g., inhaled corticosteroids or cromolyn or oral leukotriene modifiers), then consideration should be given to continuing these medications during the testing. The member should not use bronchodilators (short- or long-acting bronchodilators) the day of testing because these medications can undermine the purpose of the test, that is, to demonstrate normal pulmonary function without clinically significant bronchodilator response or airway hyperreactivity. Provocative challenge testing should be performed the first time the member is evaluated for asthma and only if all the provisions in 9.7.6.1(1) through 9.7.6.1(7) indicate that the member’s asthma is under acceptable control. Provocative challenge testing is not required annually and should be repeated only if clinically indicated.

**A.9.7.7** A member with current or recent history of allergic-induced, reversible bronchospasm is no different from a non-allergic asthmatic in his/her ability to safely perform the essential job tasks associated with non-allergic irritant exposures, as the majority will remain hyperreactive for 4 to 8 weeks after allergic-induced bronchospasm. Two caveats exist. First, some members could have a distant history of allergic asthma, are unlikely to be exposed to this allergen again, or have successfully been desensitized by an allergist. These members, if asymptomatic off asthma medications for 2 months, can perform all essential job tasks with reasonable safety. If asthma is still suspected then the member should be evaluated as in 9.7.6. Provocative challenge testing should only be to general irritants (e.g., cold air, exercise, or methacholine). Specific allergen challenge testing should not be performed, as the risk for life-threatening asthma outweighs the benefit. Second, members can have allergic rhinitis, sinus or skin

conditions without a history, or suspicion of clinical asthma. These members do not need specialized pulmonary testing.

**A.9.7.8** Moderate to severe chronic obstructive pulmonary disease is characterized by an FEV<sub>1</sub>/FVC ratio of 0.45 to 0.59 (absolute ratio rather than percent of predicted) and severe chronic obstructive pulmonary disease by an absolute FEV<sub>1</sub>/FVC ratio equal to or less than 0.07 and an FEV<sub>1</sub> less than 0.70 percent predicted. Additional tests that can be of value are lung volumes, gas exchange parameters (diffusing capacity, oxygen saturation, arterial blood gases), chest radiograph, and chest CAT scan. With moderate to severe chronic obstructive pulmonary disease, elevated respiratory workload and lack of respiratory reserve will not provide adequate gas exchange for the safe performance of essential job tasks. Working in this environment has the potential for increasing carbon monoxide levels, decreasing oxygen levels, and reducing oxygen delivery, and the extent of this reduction and resulting risk is directly related to the degree of dysfunctional gas exchange already present prior to the performance of essential job tasks. It also has the likely potential for acutely aggravating pre-existing airway hyperreactivity commonly found in patients with moderate to severe chronic obstructive pulmonary diseases (bronchitis, etc.). Acute hyperreactivity in this environment can induce immediate or progressive clinical asthma (bronchospasm and wheeze) that can lead to sudden incapacitation from status asthmaticus and/or cardiac ischemia. In contrast, asymptomatic members with mild chronic obstructive pulmonary disease (an absolute FEV<sub>1</sub>/FVC equal to or less than 0.70 and an FEV<sub>1</sub> above 70 percent predicted) and without airway hyperreactivity might be able to safely perform essential job tasks. However, if members with mild chronic obstructive pulmonary disease are symptomatic, especially during exercise or on the fire ground, then appropriate additional testing can be useful, including pre- and post-spirometry, lung volumes, gas exchange parameters (diffusing capacity, oxygen saturation, arterial blood gases), exercise testing, and/or provocative challenge testing.

**A.9.7.14** Members who are otherwise qualified can safely resume fire-fighting duties as long as they have recovered from their pneumothorax (with or without surgery) and their pulmonary function has returned to acceptable limits. Most patients with spontaneous pneumothorax have cysts or bullous disease from congenital or infectious etiology. Some have bullous disease due to chronic pulmonary disease. Usually, those with congenital or infectious cause will have pulmonary function tests that are compatible with the safe use of SCBA while those with chronic pulmonary disease can have pulmonary function tests that are not compatible with the safe performance of essential job tasks 1, 2, 3, 4, 5, and 7. Regardless of cause, many (10 percent to 20 percent) will have a recurrence on the same side unless surgically corrected. After the pneumothorax has resolved, surgical correction of underlying cystic/bullous disease is not a prerequisite for returning to fire-fighting duty as long as pulmonary function allows for the safe use of SCBA.

**A.9.7.16** Significant pleural effusions should be referred for diagnostic tests, as new or increasing effusions can be a sign of cardiac, liver, or renal disease, pneumonia, empyema, tuberculosis, or cancer. When these illnesses are severe enough to cause pleural effusions, they compromise the ability to safely perform essential job tasks due to limitations of endurance or inability to safely wear SCBA. If not the illnesses causing pleural effusions, then pulmonary function tests should be as-

sessed. Moderate to severe restriction (FVC less than 60 percent of predicted with an absolute FEV<sub>1</sub>/FVC ratio greater than or equal to 0.90) compromises the member's ability to safely perform essential job tasks unless a more complete evaluation of gas exchange and exercise capacity shows the ability to exercise at a workload of 12 METs without evidence of hypoxia or exercise desaturation.

**A.9.8.9** After acute infection has resolved, the fire fighter can return to work if weight, muscle strength, cardiac function, and function of other involved organs have returned to levels required for safe performance of essential job tasks. Concepts used within this document for each of these organ systems should be applied here.

**A.9.8.10** After active infection has resolved (e.g., sputum AFB or sputum culture negative for 3 successive days) and the fire fighter is no longer contagious (usually within 2 weeks of successful treatment), the fire fighter can return to work but perform only essential job tasks 1, 2, 3, 4, 5, 7, and 9 if weight, muscle strength, pulmonary function, and function of other involved organs have returned to acceptable levels for safe performance. Concepts used within this document for each of these organ systems should be applied here. A positive tuberculin (PPD) skin test or a positive tuberculin blood test without symptoms and with a normal chest radiograph indicates exposure, and latent infection without evidence for active infection does not prevent a fire fighter from performing essential job tasks. Alternatively, a positive TB skin test (PPD) can be a false-positive from exposure to atypical mycobacterium or from prior BCG vaccination. The TB blood test does not produce these false positives, but experience with false negatives is limited [*Mortality and Morbidity Weekly Review*, December 16, 2005]. If conversion from negative to positive tuberculin test (PPD or blood test) occurred within the last 2 years, there is increased risk for the development of active contagious tuberculosis, which requires either treatment or frequent monitoring for symptoms and chest radiograph changes (annually for at least 2 years or during evaluation of current symptoms). Members on prophylactic treatment can perform all essential job tasks without restrictions. Treatment is a personal decision, but in its absence, monitoring with chest radiographs at prescribed intervals is mandatory because development of active disease is a public health hazard to other members and the public.

**A.9.8.11** Hepatitis, when not acute or when chronic but without symptoms and without significant liver dysfunction or other organ system dysfunction, does not prevent the successful and safe performance of essential job tasks during fire fighting or EMS work. Hepatitis A, when not acute, is no longer a public health risk. Hepatitis B, C, and so forth, are bloodborne pathogens and are not a public health risk, as universal precautions to prevent the spread of bloodborne infections are a mandatory part of all emergency operations. Treatment to prevent Hepatitis C from progressing to liver insufficiency or failure (cirrhosis) is now available and FDA approved. Members receiving this treatment need to be regularly evaluated to determine their ability to safely perform their essential job tasks. This combination drug therapy protocol can produce dehydration, fatigue, depression, anemia, thrombocytopenia (bleeding disorder), and so forth.

**A.9.8.12** HIV without AIDS does not prevent the successful and safe performance of essential job tasks during fire fighting or EMS work. HIV is a bloodborne pathogen and is not a public health risk, as universal precautions to prevent the spread





of bloodborne infections are a mandatory part of all emergency operations. The fire fighter with AIDS but without significant organ dysfunction is able to safely perform essential job tasks after careful evaluation. Treatment to prevent AIDS from occurring when HIV infection occurs or to control the progression of AIDS is available and FDA approved. Members receiving this treatment need to be regularly evaluated to determine their ability to safely perform the essential job tasks on the fire ground, during emergency operations, and when wearing protective clothing. This combination drug therapy protocol can produce dehydration, fatigue, depression, anemia, thrombocytopenia (bleeding disorder), and so forth.

**A.9.9** The personal protective ensemble and SCBA can place the fire fighter's spine at a biomechanical disadvantage due to added weight and altered center of gravity. Certain medications (narcotics and muscle relaxants) used to treat spinal conditions can frequently produce or worsen somnolence, discoordination, and disequilibrium. Neurologic dysfunction, regardless of cause, can produce sudden incapacitation, which when working in dangerous environments can result in life-threatening injuries.

**A.9.10** Fire fighters with active, ongoing, or recurrent orthopedic disorders can have difficulty due to reduced motor strength, sensation, and flexibility as well as problems with fatigue, coordination, gait, and equilibrium. These physical abilities are required to safely perform essential job tasks 1, 2, 4, 5, 6, 7, 8, and 13. The protective uniform and SCBA can place the fire fighter's involved extremity (upper or lower) at a biomechanical disadvantage due to added weight and altered center of gravity. Certain medications (narcotics and muscle relaxants) used to treat orthopedic conditions can produce or worsen somnolence, discoordination, and disequilibrium.

**A.9.12.1** The fire fighter works in hazardous environments, both on the fire ground and during other emergency operations. Heavy debris can fall on the fire fighter. The helmet offers some protection when it fits well and is worn properly. The fire fighter with a defect in the skull is more vulnerable to head trauma and life-threatening sudden incapacitation. The fire fighter is also exposed to biological aerosols, particulates, smoke, and hazardous materials. Defects in the structure of the face, nose, mouth, or throat can prevent acceptable fit testing of a respirator (N-95, P-100, or SCBA).

**A.9.12.3.1** Diseases of the eye such as retinal detachment, progressive retinopathy, optic neuritis (severe or progressive), macular degeneration, cataracts, and glaucoma can result in the failure to read placards and street signs or to see and respond to imminently hazardous situations. Evaluation of visual acuity and visual fields with consultation by an ophthalmologist is suggested.

Ophthalmological procedures such as radial keratotomy and repair of retinal detachment require sufficient time (approximately 2 weeks for radial keratotomy and Lasik-type surgery and 3 months for retinal detachment) to allow stabilization of visual acuity and to ensure that there are no post-surgical complications. Members should be cleared for duty by the ophthalmologic surgeon who understands the essential job tasks associated with fire fighting. These ophthalmological procedures can result in the failure to be able to read placards and street signs or to see and respond to imminently hazardous situations.

The fire service physician should also consider any color vision deficiency of the member in view of the color vision requirements of the member's specific job in a given fire department.

**A.9.12.3.1(1)** Far visual acuity is at least 20/40 binocular, corrected with contact lens or spectacles. Far visual acuity uncor-

rected is at least 20/100 binocular for wearers of hard contacts or spectacles. Successful long-term soft contact lens wearers (i.e., 6 months without a problem) are not subject to the uncorrected standard. Inadequate far visual acuity can result in the failure to be able to read placards and street signs or to see and respond to imminently hazardous situations.

**A.9.12.3.1(2)** Most persons with monocular vision, after a 6-month accommodation period, are able to function well. There is some loss of depth perception and peripheral vision. The loss of depth perception has not been shown to be of a type that will affect a member's ability to safely perform essential fire-fighting tasks. Some very specialized tasks can be difficult to safely perform, and the fire service physician should consider the depth of field deficiency of the individual and consider the depth of field requirements of the member's job in order to reach an individual determination. It should be noted that the FAA will award all classes of pilot's licenses to monocular pilots. The loss of peripheral vision is compensated for by increased scanning and head movements. There are studies that show some detriment of driving function in the driving lab. As of the writing of this section the DOT does not allow monocular persons to hold a commercial driver's license. In view of this and the increased dependence on visual cues when driving emergency vehicles, monocular fire fighters should be restricted from driving fire apparatus and other emergency vehicles.

**A.9.12.4.1** Baseline and annual audiometry is performed on each fire fighter. This should be done in accordance with 29 CFR 1910.95, "Occupational noise exposure." The basics of this standard include the following:

- (1) The first audiogram done (for members this will probably be done during their pre-placement exam) becomes the baseline audiogram.
- (2) If subsequent audiograms are better than the baseline, then the best one becomes the baseline. All audiograms should be done with no exposure to industrial noise for 14 hours.
- (3) Each subsequent audiogram is compared to the baseline audiogram (not to the previous year's) to determine if there is a threshold shift, which is an average loss of 10 dB or more at 2000 Hz, 3000 Hz, and 4000 Hz in either ear. This number should be corrected for presbycusis by age tables [see Table A.9.12.4.1(a) and Table A.9.12.4.1(b)]. Thus, for each of the three frequencies the baseline reading is subtracted from the current reading, and the presbycusis correction is subtracted from this result. The results from the three frequencies are averaged, and if this number is 10 or greater, then there is a threshold shift.

Audiometric pure tone threshold testing includes frequencies 500 Hz, 1000 Hz, 2000 Hz, 3000 Hz, 4000 Hz, and 6000 Hz. Tests are performed using audiometric instrumentation calibrated to ANSI S3.6, *Specification for Audiometers*.

Fire fighters should have adequate hearing in order to hear a victim cry for help, to hear a PASS alarm, to hear noises associated with imminent collapse, or to hear noise associated with changes in the fire pattern. Hearing and the ability to localize sounds is crucial in a fire-fighting environment where smoke often minimizes visual cues and there is a high degree of background noise and stress-related distractions. Fire fighters should be able to hear fire department portable and vehicle radio communications. They should be able to hear, discriminate, and localize safety-related acoustic cues such as air horns, sirens, screams, collapsing walls, beams, timbers, or gas



Table A.9.12.4.1(a) Age Correction Values in Decibels for Males

Years	Audiometric Test Frequency (Hz)				
	1000	2000	3000	4000	6000
≤20	5	3	4	5	8
21	5	3	4	5	8
22	5	3	4	5	8
23	5	3	4	6	9
24	5	3	5	6	9
25	5	3	5	7	10
26	5	4	5	7	10
27	5	4	6	7	11
28	6	4	6	8	11
29	6	4	6	8	11
30	6	4	6	9	12
31	6	4	7	9	13
32	6	5	7	10	14
33	6	5	7	10	14
34	6	5	8	11	15
35	7	5	8	11	15
36	7	5	9	12	16
37	7	6	9	12	17
38	7	6	9	13	17
39	7	6	10	14	18
40	7	6	10	14	19
41	7	6	10	14	20
42	8	7	11	16	20
43	8	7	12	16	21
44	8	7	12	17	22
45	8	7	13	18	23
46	8	8	13	19	24
47	8	8	14	19	24
48	9	8	14	20	25
49	9	9	15	21	26
50	9	9	16	22	27
51	9	9	16	23	28
52	9	10	17	24	29
53	9	10	18	25	30
54	10	10	18	26	31
55	10	11	19	27	32
56	10	11	20	28	34
57	10	11	21	29	35
58	10	12	22	31	36
59	11	12	22	32	37
≥60	11	13	23	33	38

Source: [29 CFR 1910.95].

leaks to safely perform their critical job tasks during fire suppression and fire rescue.

These critical job tasks need to be safely performed under conditions of extreme background noise and SCBA noise as typically found at the incident scene. The inability to hear sounds of low intensity or to distinguish voice from background noise can lead to failure to respond to imminently hazardous situations

Table A.9.12.4.1(b) Age Correction Values in Decibels for Females

Years	Audiometric Test Frequency (Hz)				
	1000	2000	3000	4000	6000
≤20	7	4	3	3	6
21	7	4	4	3	6
22	7	4	4	4	6
23	7	5	4	4	7
24	7	5	4	4	7
25	8	5	4	4	7
26	8	5	5	4	8
27	8	5	5	5	8
28	8	5	5	5	8
29	8	5	5	5	9
30	8	6	5	5	9
31	8	6	6	5	9
32	9	6	6	6	10
33	9	6	6	6	10
34	9	6	6	6	10
35	9	6	7	7	11
36	9	7	7	7	11
37	9	7	7	7	12
38	10	7	7	7	12
39	10	7	8	8	12
40	10	7	8	8	13
41	10	8	8	8	13
42	11	8	9	9	13
43	11	8	9	9	14
44	11	8	9	9	14
45	11	8	10	10	15
46	11	9	10	10	15
47	11	9	10	11	16
48	12	9	11	11	16
49	12	9	11	11	16
50	12	10	11	12	17
51	12	10	12	12	17
52	12	10	12	13	18
53	13	10	13	13	18
54	13	11	13	14	19
55	13	11	14	14	19
56	13	11	14	15	20
57	13	11	15	15	20
58	14	12	15	16	21
59	14	12	16	16	21
≥60	14	12	16	17	22

Source: [29 CFR 1910.95].

and thus lead to life-threatening sudden incapacitation to the member or others depending on the member.

Hearing aid use or cochlear implants are not considered a reasonable accommodation for the following reasons:

- (1) U.S. FDA regulations (21 CFR 801.420) require that all hearing aids be labeled with a statement that hearing aids or cochlear implants do *not* restore normal hearing.



- (2) Hearing aids are adjusted to restore one-third to one-fourth the measured loss in pure tone frequency range of 250 to 6000 Hz [National Acoustic Labs]. This allows for improved hearing of speech but will not restore ability to hear or discriminate acoustic cues (such as collapsing wall/timber, gas leaks, traffic sounds) or radio broadcasts that are essential safety requirements at a fire or rescue scene.
- (3) Hearing aids seriously compromise the ability to localize acoustic cues so that the source of impending danger is confused and safety is imperiled.
- (4) Hearing aids are not calibrated to function in areas of high background noise (fire scene, rescue scene, traffic) or during radio transmissions.
- (5) Hearing aids are not reliable after submersion or heavy exposure to water.
- (6) If there is a threshold shift the AHJ must be notified. AHJs are responsible for initiating evaluation of personal protective equipment (PPE) and engineering controls.
- (7) If there is a threshold shift, the member should be advised in writing and referral to an audiologist and/or an otolaryngologist should be made.
- (8) If the threshold shift is determined to be permanent, then this audiogram becomes the “revised baseline.”

**A.9.12.5.1** Intact gait and balance are required to safely perform critical tasks such as climbing stairs, carrying heavy items (tools, equipment, victims, stretchers), climbing ladders, and walking on narrow/elevated/inclined areas (roofs). A fire fighter's balance can be further stressed by the need to safely perform these critical job tasks wearing personal protective clothing and SCBA.

Any symptomatic balance disturbance, vertigo, change of gait and coordination, or history of these that has not resolved completely should be fully investigated. Examples include but are not limited to Ménière's syndrome, severe labyrinthitis, and cerebellar syndromes. Current use of medications needs careful evaluation to be certain that the condition is completely controlled and that the side effects of the medication do not impose additional unacceptable risks for the successful and safe performance of critical job tasks.

**A.9.12.6.1** The face, nasal, oropharyngeal, and dental structures should be of sufficient structure and function to allow the proper use and fitting of required respiratory protection (N-95, P-100, SCBA) and other protective clothing and gear. These structures should allow sufficient function for proper nutrition, balance, communication, and respiration. Aphonia, severe dysphonia, or a speech pattern that prevents oral communication during fire or emergency operations should resolve or be corrected.

Anosmia (loss of smell) can interfere with the ability to safely perform critical tasks on the fire ground. Evaluation of anosmia is difficult, as objective testing is not available in most medical settings.

Recurrent sinusitis (severe, requiring repeated hospitalizations or repeat surgery) can interfere with the successful and safe performance of critical tasks due to inability to effectively wear SCBA and inability to safely perform other critical tasks during emergency operations due to limitations of pain, endurance, or respiration.

Severe and recurrent epistaxis can prevent successful and safe performance of critical tasks due to inability to wear SCBA on the fire ground.

Orthodontic and certain other maxillofacial appliances or prostheses can preclude safe and effective use of protective

equipment and compromise nutritional or hydration status or ability to communicate.

Pharyngeal or laryngeal stenosis, mass, or accessory tissues can interfere with speech, communication, or respiration, which will not permit the successful and safe performance of critical tasks on the fire ground and during emergency operations, especially when wearing SCBA and personal protective clothing.

**A.9.12.6.2** Untreated obstructive sleep apnea is associated with fatigue, cognitive defects, pulmonary hypertension, hypertrophic heart disease, arrhythmias, and early onset dementia. These issues can reduce the ability to perform all essential job tasks. Risk factors for developing obstructive sleep apnea include male gender, increased body mass index (BMI), short/wide neck, and/or narrow throat. Screening questionnaires, such as the Berlin Questionnaire (assessing snoring, fatigue, obesity and hypertension) can be used to determine those who require formal sleep testing. In those with obstructive sleep apnea, additional testing is required to determine the level of positive pressure (CPAP or BIPAP) required to overcome the obstruction. Compliance with treatment can be assessed using home monitoring devices attached to the CPAP or BIPAP machine. Target organ damage can be screened for by cardiac echo for evidence of pulmonary hypertension or right ventricular hypertrophy.

**A.9.13** Fire fighters with active, ongoing, or recurrent neurologic disorders can have difficulty following orders, communicating information, and working in a coordinated manner with workers, victims, and involved civilians (essential job tasks 11, 12, and 13). Fire fighters with neurologic disturbances can also have difficulty with fatigue, somnolence, cognitive function, motor strength, sensation, coordination, gait, and equilibrium, all required to safely perform essential job tasks. The fire fighter often is exposed to considerable stress (temperature, physical exertion, and psychological) during emergency operations. Stress conditions can exacerbate or highlight neurologic deficiencies when the fire fighter is performing essential job tasks rapidly during an emergency operation where there is little room for error and where such errors can have life-threatening consequences for the fire fighter, colleagues, or victims. Removing oneself from the scene, even temporarily, can significantly impact on the success of the operation. Medications used to treat neurologic conditions can frequently produce or worsen somnolence, discoordination, and/or disequilibrium.

**A.9.13.4.1** Cerebral vascular insufficiency includes the spectrum of syndromes from transient ischemic attack (TIA) to stroke, and its cause should be investigated. If due to arteriovenous malformation, cerebral aneurysm, or bleeding, then see specific recommendations. If due to hypertension, then this is evidence of end organ disease. Stroke does not permit safe performance of essential job tasks (1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13) since the physiological stress associated with strenuous physical exertion can increase the likelihood for new strokes leading to life-threatening sudden incapacitation. Cerebral vascular insufficiency can affect control of respiration, cognitive abilities, communication, motor strength, sensation, coordination, and equilibrium. If stroke is due to embolic disease, then risk factors (hypercoagulable state, collagen vascular disease, carotid vascular disease, patent foramen ovale, cardiac disease) need to be evaluated. Ability to safely perform essential job tasks is based on an evaluation of current neurologic status, treatment, and any contributory underlying

conditions. (For example, Warfarin and other anticoagulant treatment regimens do not allow the safe performance of essential job task 8.)

**A.9.13.5.1 Myasthenia gravis** could compromise a member's ability to safely perform essential job tasks 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13. In considering performance of essential job tasks, the impact of the operational environment (heat, stress, activity, duration, variable night shifts, etc.) on exacerbations should be considered and specifically addressed by a knowledgeable neurological specialist and the fire department physician. The neurologist must indicate that the member's cognitive function and neurological exam are normal and the member is off all drug treatment. The member cannot safely perform essential job tasks if there is evidence of respiratory muscle weakness or prior episode of respiratory muscle weakness in the last 3 years. The member cannot safely perform essential job tasks if on drug treatment for myasthenia including corticosteroids, cytotoxic drugs (e.g., Imuran), and/or plasmapheresis; these treatments indicate that disease is still active and likelihood for exacerbation and life-threatening sudden incapacitation exists during emergency operations.

**A.9.13.6.1 Epilepsy** is defined as the presence of "unprovoked, recurrent seizures — paroxysmal disorders of the central nervous system characterized by an abnormal cerebral neuronal discharge with or without loss of consciousness." Generalized, complex, partial, simple epilepsy, or recurrent seizures, even those that do not impair consciousness, prevent safe performance of essential job tasks 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 because of the uncertainty regarding how much of the brain could be involved and the risk of propagation to other regions of the brain, particularly in the highly epileptogenic environment of the fire ground.

Treatment of patients with epilepsy is only variably successful, with roughly 40 percent of patients attaining remission on anticonvulsant therapy. Remission is defined as 5 years without recurrence of seizure activity. Further complicating the fitness-for-duty issue is the fact that only 50 percent of patients who achieve remission do so without toxic side effects of the anticonvulsant drug.

As much as 10 percent of the population will experience at least one seizure in a lifetime, whereas less than 1 percent of the population qualifies for a diagnosis of epilepsy.

Many conditions producing seizures in the pediatric age group are known to remit prior to adulthood, and many adults sustain a reactive seizure that can be attributed to a reversible, underlying precipitant. These circumstances do not necessarily represent an ongoing risk of sudden, unpredictable incapacitation of a member. After a provoked seizure, with the precipitant identified and alleviated, the member can be cleared for duty if anticonvulsants are not prescribed and the conditions described in 9.13.6.1(2) through 9.13.6.1(5) are met.

**A.9.13.7.1** The cause of cerebral bleed needs to be determined. If due to hypertensive bleed, then this is evidence for target organ disease. Hypertension with target organ disease does not permit safe performance of essential job tasks 1, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13, as the hypertension and stress associated with strenuous physical exertion can increase the likelihood for new bleeds and strokes leading to life-threatening sudden incapacitation due to central nervous system instability affecting control of respiration, cognitive abilities, communication, motor skills, sensory abilities, coordination, and equilibrium.

Arteriovenous malformation or cerebral aneurysm does not allow for the safe performance of essential job tasks 1, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 since hypertension and stress associated with strenuous physical exertion can increase the likelihood for acute rupture and stroke leading to life-threatening sudden incapacitation. Members can safely return to duty after evaluation by a neurosurgeon if resection was successful, exam and imaging studies are normal (except for surgical site), and EEG shows no epileptic activity off all anticonvulsant medications.

**A.9.13.8.1** Essential job tasks 1, 4, 6, 7, 8, 9, 10, 11, 12, and 13 might not be performed safely unless after evaluation by a specialist it is concluded that exam is normal and imaging studies are normal. If trauma produced seizures, then see recommendations for seizures in A.9.13.6.1.

**A.9.14** Fire fighters perform individually and as a team. Fire fighters with active, ongoing or recurrent, psychiatric and/or psychological conditions can have difficulty following orders, communicating information, and working in a coordinated manner with workers, victims, and involved civilians. The fire fighter with a personality disorder might not respond appropriately to command structure or adequately control his/her interpersonal behavior. Behavior that undermines command structure, group function, and/or group cohesion is not safe to the member or others performing essential job tasks. Fire fighters are exposed to gruesome tragedy during emergency operations, further exacerbating the stress of the job. Removing oneself from the scene, even temporarily, can significantly impact on the success of an emergency operation. Medications used to treat psychiatric or psychological conditions can produce or worsen somnolence, impair coordination, and predispose to heat stress.

**A.9.15** Substance abuse interferes with cognitive functions, energy, command structure, communication, strength, sensation, gait, coordination, and equilibrium, and therefore compromises the member's ability to safely perform essential job tasks 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13. There is increased risk for auto accidents when driving departmental vehicles. Dehydration, arrhythmia, and disequilibrium can be life threatening in a toxic/traumatic/stress environment. Fire fighting requires members to perform independently and in coordination with others. Behavior that undermines command structure, group function, and/or group cohesion during emergency operations is not safe to the member or others at the scene.

**A.9.18.2 Medical Information Regarding Issues Related to Pregnancy in Fire Fighters.** The following information is intended to help female fire fighters make informed decisions regarding their job activities if they are pregnant or considering pregnancy. The majority of pregnant fire fighters will be able to continue to work throughout pregnancy, with some accommodations. They should discuss with their treating physician any individual conditions that may require limitation of activities during pregnancy.

The following occupational hazards can have adverse effects at any time during pregnancy:

- (1) Products of combustion, especially carbon monoxide
- (2) Excessive heat
- (3) Other toxic chemicals, including prolonged exposure to vehicular exhaust
- (4) Trauma (even simple falls)



*First trimester.* In addition to the above, there are no other activities with an adverse effect. The risk to the fetus created by heat is highest during the first two months of pregnancy.

*Second trimester.* In addition to the above, the following activities may have adverse effects:

- (1) Alternating shift work, prolonged standing, and heavy lifting
- (2) Noise exposure

*Third trimester.* In addition to the above, there are no other activities with an adverse effect. Activities that involve or require aerobic fitness, speed, agility, and balance can be adversely affected by body changes during pregnancy.

*Personal protective equipment.* PPE is not designed to protect the fetus. The PPE fitted pre-pregnancy might not offer the same level of protection during pregnancy and might need to be refitted.

*Post-delivery.* Return-to-work decisions should be based on an individualized evaluation of the member's current status, the requirements of her work assignment, and the type of delivery and its complications.

*Lactation.* Exposure to toxic substances might result in the substances being present in breast milk.

## Annex B Guide for Fire Department Administrators

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

**B.1 Legal Considerations in Applying the Standard.** The consideration of an application or continued employment of a member based on medical or physical performance evaluations involves a determination that is not without legal implications. To this end, prior to making an adverse employment decision based on the current standard, the authority with jurisdiction might wish to consult with legal counsel.

**B.1.1 Legal Protections for Individuals with Handicaps or Disabilities.** The Rehabilitation Act of 1973, as amended, 29 U.S.C. § 791 et seq., and implementing regulations prohibit discrimination against those with handicaps or disabilities under any program receiving financial assistance from the federal government. The Americans with Disabilities Act (ADA) of 1990, 42 U.S.C. § 12101 et seq., also prohibits employment discrimination by certain private employers against individuals with disabilities. In addition, many states have enacted legislation prohibiting discrimination against those with handicaps or disabilities. Generally speaking, these laws prevent the exclusion, denial of benefits, refusal to hire or promote, or other discriminatory conduct against an individual based on a handicap or disability, where the individual involved can, with or without reasonable accommodation, perform the essential functions of the job without creating undue hardship on the employer or program involved.

Beginning in 1999, the United States Supreme Court has issued a series of decisions limiting the scope of the ADA. As a result, persons with certain kinds of impairments that are mitigated by corrective measures such as medication for high blood pressure or eyeglasses for myopia are not "disabled" under the ADA. See *Sutton v. United Airlines, Inc.*, 527 U.S. 471 (1999); *Murphy v. United Parcel Service, Inc.*, 118 S. Ct. 2133 (1999); and *Albertsons, Inc. v. Kirkingburg*, 527 U.S. 555 (1999). More recently the Supreme Court held that an impairment is not a disability covered by the ADA unless it severely restricts a person from doing activities that are of central importance to

most people's daily lives. See *Toyota Motor Mfg., Kentucky, Inc. v. Williams*, 534 U.S. 184 (2002). These cases significantly limit the persons who can claim the protections of the federal ADA, but do not, by any means, eliminate the ADA as an important consideration in fire service-related employment decisions. Moreover, it should be borne in mind that separate disability protections exist under laws of many states, and some of these laws have been interpreted to afford greater protections than that afforded by the ADA. See, for example, *Dahill v. Boston Department of Police*, 434 Mass. 233 (2001), where the Supreme Judicial Court of Massachusetts ruled that a corrective device to alleviate a disability is not relevant in determining whether someone is disabled under the state's disability law.

The disability discrimination laws, therefore, continue to be an important part of the legal framework that governs employment-related decisions. Although this standard has been developed with this in mind, these laws can, depending on the jurisdiction and the circumstances, affect the degree to which the authority having jurisdiction can implement the standard in an individual case. Users of this standard should be aware that, while courts, in assessing disability discrimination claims, are likely to give considerable weight to the provisions of a nationally recognized standard such as NFPA 1582 [see, for example, *Miller v. Sioux Gateway Fire Department*, 497 N.W.2d 838 (1993)], reliance on the standard alone might not be sufficient to withstand a challenge to an adverse employment decision.

**B.1.2 Legal Protections for Individuals Who Are Members of Protected Classes (Race, Sex, Color, Religion, or National Origin).** Title VII of the Civil Rights Act of 1964, as amended, 42 U.S.C. § 2000e, and implementing regulations by the Equal Employment Opportunity Commission (EEOC) prohibit discrimination in employment on the basis of race, sex, color, religion, or national origin (i.e., protected classes). Under Title VII, an "employer" is defined, generally, to mean a person with "15 or more employees for each working day in each of 20 or more calendar weeks in the current or preceding calendar year" (42 U.S.C. § 2000e). Several federal jurisdictions have held that unpaid volunteers are not considered to be "employees" under Title VII.

Additionally, many states, cities, and localities have adopted similar legislation. Generally, physical performance or other requirements that result in "adverse impact" on members of a protected class (e.g., on the basis of gender) are required to be validated through a study in accordance with EEOC guidelines, if such requirements are to be relied on in making employment decisions. Under EEOC guidelines, a study validating employment standards in one jurisdiction can be transportable to another jurisdiction (and therefore used in lieu of conducting a separate study). However, specific preconditions must be met in this regard, and the authority having jurisdiction should seek the advice of counsel before relying on a transported validation study.

**B.1.2.1 Pregnancy and Reproduction.** Federal regulations, as well as many court decisions, including the U.S. Supreme Court's decision in *International Union, et al. v. Johnson Controls, Inc.* [499 U.S. 187, 111 S. Ct. 1196 (1991)], have interpreted the requirements of Title VII with respect to pregnancy and reproduction. The AHJ should seek the advice of counsel in resolving specific questions concerning these requirements as well as other requirements that can be imposed by state or local laws.



**B.2 Determining Essential Job Tasks.** The medical requirements in this edition of the standard were revised based on the essential job tasks contained in Chapter 5 and Chapter 9. It is recognized that some fire-fighting functions and tasks can vary from location to location due to differences in department size, functional and organizational differences, geography, level of urbanization, equipment utilized, and other factors. Therefore, it is the responsibility of each individual fire department to document, through job analysis, the essential job functions that are performed in the local jurisdiction.

There are a wide variety of job analytic techniques available to document the essential functions of the job of a member. However, at a minimum, any method utilized should be current, in writing, and meet the provisions of the Department of Labor regulations [29 CFR 1630.2(n)(3)]. Job descriptions should focus on critical and important work behaviors and specific tasks and functions. The frequency and/or duration of task performance and the consequences of failure to safely perform the task should be specified. The working conditions and environmental hazards in which the work is performed should be described.

The job description should be made available to the fire department physician for use during the pre-placement medical examination for the individual determination of the medical suitability of applicants for membership.

**B.3 Choosing a Fire Department Physician.** Several factors should be considered in choosing a fire department physician. There are relatively few physicians with formal residency training and certification in occupational medicine. The fire department physician should be qualified to provide professional expertise in the areas of occupational safety and health as these areas relate to emergency services. For the purpose of conducting medical evaluations, the fire department physician should understand the physiological and psychological demands placed on members as well as the environmental conditions under which members have to perform.

Knowledge of occupational medicine and experience with occupational health programs are essential for physicians not formally trained in occupational medicine.

The physician must be committed to meeting the requirements of the program, including appropriate record keeping. The physician's willingness to work with the department to continually improve the program is also important. Finally, the physician's concern and interest in the program and in the individuals in the program are vital.

The following are some of the many options for obtaining physician services:

- (1) Physicians can be paid on a service basis or through a contractual arrangement.
- (2) For volunteer departments, local physicians might be willing to volunteer their services for the program, with other arrangements for payment of laboratory testing, x-rays, and so forth.
- (3) Some departments might utilize a local health care facility for medical care. However, in that case, the department should have one individual physician responsible for the program, record keeping, and so forth.
- (4) A military reserve or a National Guard unit can be used.

**B.4 Coordinating the Medical Evaluation Program.** An individual from within the department should be assigned the responsibility for managing the health and fitness program, including the coordination and scheduling of evaluations and examinations. This person should also act as liaison between

the department and the physician to make sure that each has the information necessary for decisions about placement, scheduling appointments, and so forth.

**B.5 Confidentiality.** Confidentiality of all medical data is critical to the success of the program. Members need to feel assured that the information provided to the physician will not be inappropriately shared. No fire department supervisor or manager should have access to medical records without the express written consent of the member. There are occasions, however, when specific medical information is needed to make a decision about placement, return to work, and so forth, and a fire department manager should have more medical information for decision making. In that situation, written medical consent should be obtained from the member to release the specific information necessary for that decision.

Budgetary constraints can affect the medical program. Therefore, it is important that components of the program be prioritized such that essential elements are not lost. With additional funding, other programs or testing can be added to enhance the program.

## **Annex C Protocols for Evaluation of Fitness of Members**

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

**C.1 Annual Fitness Evaluation.** The copyrighted material in C.1.1 is extracted from Chapter 4 of NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Department Members*, 2008 edition.

### **C.1.1 General.**

**C.1.1.1** All members shall participate in a periodic fitness assessment under supervision of the department health and fitness coordinator (HFC) and shall provide the HFC with data on which to base individual exercise prescription.

**C.1.1.2** The fitness assessment shall be conducted at least annually.

### **C.1.2 Fitness Assessment.**

**C.1.2.1** All members shall be cleared for participation in the fitness assessment by the fire department physician.

**C.1.2.2** 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 presents to the fire department for review.

**C.1.3 Pre-Assessment Questionnaire.** The HFC 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.

**C.1.4 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



**C.1.4.1 Sample Assessment Protocols for the Health-Related Components of Fitness.** The following examples of assessment protocols for health-related components of fitness vary in terms of ease of administration, safety, cost, and predictive value:

- (1) Aerobic capacity
  - (a) 1-mile walk
  - (b) 1.5-mile run/walk
  - (c) 12-minute run
  - (d) Step test (various)
  - (e) Stairclimbing machine
  - (f) Cycle ergometer (various)
  - (g) Treadmill (various)
- (2) Percentage of body fat
  - (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
  - (a) Handgrip dynamometer
  - (b) Static bicep curl with dynamometer
  - (c) Static leg press with dynamometer
  - (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
  - (a) Push-ups
  - (b) Modified push-ups
  - (c) Pull-ups
  - (d) Bent knee sit-ups
  - (e) Crunches given time
  - (f) Crunches to cadence
- (5) Flexibility
  - (a) Sit and reach
  - (b) Modified sit and reach
  - (c) Trunk extension
  - (d) Shoulder elevation

**C.2 Annual Fitness Evaluation.** The copyrighted material in this section is reprinted with permission from the International Association of Fire Fighters (IAFF) *Fire Service Joint Labor-Management Wellness-Fitness Initiative*.

**C.2.1 Fitness Evaluation Protocols for Members.** The following mandatory fitness protocols shall be used to determine the member's baseline level of fitness and to evaluate progress from year to year. Fitness evaluations shall be under the auspices of the fire department physician. The actual evaluations are permitted to be conducted by the fire department's fitness personnel. All data collected by the evaluator is to be held confidential and maintained in the member's confidential medical file. The evaluator can provide exercise programs to encourage the members to maintain or improve their level of fitness.

There are many protocols currently available to measure the submaximal  $\text{VO}_2$  levels of apparently healthy individuals. These protocols differ in evaluation equipment (i.e., treadmill, stepmill, step, and stationary bike), rate of increasing work output, degree of increasing work output, and final result. To increase the consistency of  $\text{VO}_2$  measurements, as well as the accuracy of the data collected between members within and between participating fire departments, one of the two following submaximal protocols is to be used to predict maximum aerobic capacity. These are the WFI Treadmill Protocol

and the WFI Stepmill Protocol. Both protocols were specifically developed and validated to evaluate the sub-maximal aerobic capacity of members.

After continued evaluation and research by the IAFF/IAFC Wellness-Fitness Initiative's technical experts, it was determined that significant errors were occurring when past protocols were applied to a population that has different characteristics from those for which the evaluation was developed. For this reason, the Bruce and Balke Treadmill Protocols were removed as evaluation protocols and as a means to collect data. Both Bruce and Balke were specifically tailored for less-fit populations to determine cardiovascular pathology and thus proved to be less accurate protocols for the general members population. The YMCA Stationary Bike Test Protocol was also removed since it consistently and grossly underestimated  $\text{VO}_2$  for above average body size (i.e., most members). The Canadian Step Test was also removed since it relies on a single-stage exercise that was found to underestimate measurement of member's  $\text{VO}_2$ . The Gerkin and FDNY protocols were removed because both of these protocols were found to provide values that were somewhat variable and inconsistent with other proven measures of cardiovascular fitness.

A maximal cardiopulmonary evaluation with an electrocardiogram (ECG) shall be permitted to be used to obtain  $\text{VO}_2$  measurements. This medical evaluation shall only be conducted in a medical facility with proper monitoring by a physician and available resuscitation equipment.

The muscular endurance evaluations were also modified. In order to improve the accuracy of the evaluation and the data collection, the sit-and-hold evaluation was eliminated. The sit-up and curl-up protocols were changed to the static plank evaluation in order to ensure the safety of the participant and to improve the specificity of the evaluation. The push-up evaluation was modified to now include the option of the alternate grip push-up evaluation, to ensure participant safety and uniformity in data collection. The alternate grip push-up was added for individuals with a history of hand, wrist or shoulder injuries.

The flexibility evaluation was modified to address the difference in limb length and/or differences in proportion between an individual's arm and legs.

The IAFF/IAFC Wellness-Fitness Initiative's technical experts have evaluated all equipment utilized in these fitness protocols. The technical experts found either accuracy, maintenance, or availability problems with some evaluation equipment. Manufacturer's information and product names are included in each protocol. Unless indicated, this equipment must not be substituted with other equipment. All equipment must be maintained and properly calibrated in accordance with the manufacturer's instructions.

Members must be fully recovered from the previous evaluation before proceeding to the next evaluation. The evaluation events can be sequenced to minimize the effects of previous evaluations on subsequent evaluation performance. If evaluations for body composition, aerobic capacity, muscular strength, muscle endurance, and flexibility are to be evaluated in one evaluation battery, the following sequence should be used after completing mandatory pre-evaluation procedures:

- (1) Body composition
- (2) Aerobic capacity
- (3) Muscular strength/power
- (4) Muscle endurance
- (5) Flexibility

The following is a mandatory pre-evaluation procedure. It shall be conducted for all members prior to conducting the fitness evaluations:

- (1) Review and confirm individual's current medical status. It is required that all members are medically cleared through this standard's medical evaluation within 12 (±3) months prior to any fitness evaluation.
- (2) Notify members in advance of the scheduled time and place of physical fitness evaluations. The individual should understand the protocol and what is expected before, during, and after the evaluation, including start and stop procedures. Individual will be required to wear comfortable clothes and either sneakers or athletic shoes. All members must refrain from eating, drinking, smoking, and any physical activity prior to the evaluation to ensure accurate heart rate and blood pressure measurements.
- (3) Obtain a resting heart rate and blood pressure prior to aerobic capacity evaluation. If resting heart rate exceeds 110 beats per minute and/or resting blood pressure exceeds 160/100 mm Hg, ask the individual to relax in a quiet place for 5 minutes and re-test. If the heart rate and/or blood pressure remain at these levels, cancel the fitness evaluation and refer the individual to the fire department physician. If the retest indicates a reduction in heart rate and blood pressure, the evaluation can be given. The aerobic capacity protocols also require that age and weight in kilograms be obtained prior to the evaluation.
- (4) Review health status with the individual being evaluated. Contraindications for evaluations shall be reviewed, addressing any changes in the individual's health status since their last medical evaluation that would warrant deferring the evaluation, including:
  - (a) Chest pain during or absence of physical activity
  - (b) Loss of consciousness
  - (c) Loss of balance due to dizziness (ataxia)
  - (d) Recent injury resulting in bone, joint, or muscle problem
  - (e) Current prescribed drug that inhibits physical activity
  - (f) Chronic infectious disease (e.g., hepatitis)
  - (g) Pregnancy
  - (h) Any recent disorders that can be exacerbated by exercise
  - (i) Any other reason why the individual believes that he or she should not be physically evaluated

**C.2.1.1 Aerobic Capacity. Treadmill.** Submaximal treadmill evaluations shall use the WFI Treadmill Protocol. The treadmill should be a commercial treadmill capable of obtaining a 15-percent grade and 10 mph. A Heart Rate Monitor or equivalent shall be used for heart rate measurements and a stopwatch used for timing.

**Stepmill.** Submaximal stepmill evaluations shall use the WFI Stepmill Protocol. The stepmill shall be a Stairmaster Stepmill SM-916 or 7000 PT. A Heart Rate Monitor shall be used for heart rate measurements and a stopwatch used for timing.

**Treadmill.** Maximal treadmill evaluations shall use a continuous, multigrade medical cardiovascular protocol utilizing an electrocardiogram (ECG) for cardiac measurements. This evaluation must be under the direct supervision of a physician. The treadmill shall be a commercial treadmill capable of obtaining a 25-percent grade.

All aerobic capacity evaluation results must be recorded in milliliters (ml) of oxygen per kilogram (kg) of body weight per minute (VO<sub>2</sub>max).

- (1) Choose the aerobic capacity protocol and worksheet.
- (2) Inform the fire fighter of all evaluation components.
- (3) Ensure that the individual is in proper clothing and footwear, is comfortable, and understands all facets of the evaluation.
- (4) Review all indicators for stopping the evaluation with the individual
- (5) Place and secure heart rate monitor transmitter around individual's chest, in accordance with the manufacturer's instructions; evaluator shall hold or wear the heart rate monitor wrist receiver
- (6) Measure the fire fighter's resting heart rate and resting blood pressure and record on the protocol worksheet
- (7) Obtain and record weight and age for both protocols

Determine the participants Body Mass Index (BMI). Refer to Table C.2.1.1(a).

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

US:

$$\text{BMI} = 703 \times \frac{\text{Weight (lb)}}{\text{Height (in.)}^2}$$

- (8) Determine 85 percent of the fire fighter's estimated maximum heart rate, which will be the target exercise heart rate [see Table C.2.1.1(b)], using the following equation:

$$\text{Target exercise heart rate} = [208 - (0.7 \times \text{age})] \times 0.85$$

Example: The target exercise heart rate of a 40-year-old individual is:

$$\text{Target exercise heart rate} = [208 - (0.7 \times 40)] \times 0.85 = 153$$

If instead, maximum heart rate (MHR) had been previously measured on this individual, then 85% predicted MHR on future occasions would be more accurately calculated as:

$$\text{Target exercise heart rate} = .85 (\text{MHR} - [\text{age when MHR determined} - \text{current age}])$$

- (9) Record the target exercise heart rate on the protocol worksheet

#### C.2.1.2 Body Composition

Conduct pre-evaluation procedures. Obtain the participant's age. Note the gender-specific skinfold sites. Men are measured at the triceps, subscapular and pectoral sites; women are measured at the triceps, abdominal and suprailiac sites. All measurements should be made on the right side of the body, with the subject standing upright. Use the tape measure to mark the site to be measured with a water-soluble marker. Place calipers directly on the skin surface, 1 cm away from the thumb and finger; perpendicular to the skinfold; and halfway between the crest and base of the fold. Maintain pinch while reading the caliper. Wait 1–2 seconds (not longer) before reading caliper. Rotate through all three sites or allow time for skin to regain normal texture and thickness. Take two measurements at each site. If the values are less than 1 mm of each other then calculate the average of the two measurements. If the difference between the two measurements is greater than or equal to 1 mm, then a third measurement must be taken. If the differences between the three skinfold measurements are equal, then calculate the average of all three measurements [e.g., (1) 6 mm, (2) 9 mm, (3) 12 mm the average of all three measurements is 9 mm]. If the three measurements are not equal distance apart then calculate the average of the two closest measurements [e.g., (1) 7 mm, (2) 4 mm, (3) 5 mm the average is calculated for measurement #2





Table C.2.1.1(a) Body Mass Index (BMI)

BMI	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Height	Body Weight (pounds)																														
58" (4'10")	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172	177	181	186	191	196	201	205	210	215	220	224	229	234	239
59" (4'11")	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	212	217	222	227	232	237	242	247
60" (5')	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179	184	189	194	199	204	209	215	220	225	230	235	240	245	250	255
61" (5'1")	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185	190	195	201	206	211	217	222	227	232	238	243	248	254	259	264
62" (5'2")	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191	196	202	207	213	218	224	229	235	240	246	251	256	262	267	273
63" (5'3")	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197	203	208	214	220	225	231	237	242	248	254	259	265	270	278	282
64" (5'4")	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204	209	215	221	227	232	238	244	250	256	262	267	273	279	285	291
65" (5'5")	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240	246	252	258	264	270	276	282	288	294	300
66" (5'6")	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216	223	229	235	241	247	253	260	266	272	278	284	291	297	303	309
67" (5'7")	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230	236	242	249	255	261	268	274	280	287	293	299	306	312	319
68" (5'8")	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236	243	249	256	262	269	276	282	289	295	302	308	315	322	328
69" (5'9")	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236	243	250	257	263	270	277	284	291	297	304	311	318	324	331	338
70" (5'10")	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250	257	264	271	278	285	292	299	306	313	320	327	334	341	348
71" (5'11")	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250	257	265	272	279	286	293	301	308	315	322	329	338	343	351	358
72" (6')	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258	265	272	279	287	294	302	309	316	324	331	338	346	353	361	368
73" (6'1")	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265	272	280	288	295	302	310	318	325	333	340	348	355	363	371	378
74" (6'2")	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272	280	287	295	303	311	319	326	334	342	350	358	365	373	381	389
75" (6'3")	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279	287	295	303	311	319	327	335	343	351	359	367	375	383	391	399
76" (6'4")	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295	304	312	320	328	336	344	353	361	369	377	385	394	402	410
BMI	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50

Table C.2.1.1(b) Target Heart Rate (THR) for Respective Age

Age (yrs)	THR (BPM)	Age (yrs)	THR (BPM)	Age (yrs)	THR (BPM)	Age (yrs)	THR (BPM)
18	166	29	160	40	153	51	146
19	165	30	159	42	152	52	146
20	165	31	158	42	152	53	145
21	164	32	158	43	151	54	145
22	164	33	157	44	151	55	144
23	163	34	157	45	150	56	143
24	163	35	156	46	149	57	143
25	162	36	155	47	149	58	142
26	161	37	155	48	148	59	142
27	161	38	154	49	148	60	141
28	160	39	154	50	147	61	140

THR Formula:  $[208 - (0.7 \times 40)] \times 85$

Note: THR is used as endpoint in submaximal aerobic capacity protocols.

and #3 only. The average of the two measurements is 4.5 mm]. Once the skinfolds are collected for all three sites, calculate the sum of the average skinfold measurement for each site. (Note: Sites are specific to gender.) To determine body fat percentage, cross-reference the sum of skin folds with the subject's age on the appropriate chart provided in this section [males, Table C.2.1.2(a); females, Table C.2.1.2(b)].

#### C.2.1.2.1 Male Skinfold Sites.

*Triceps* — located at the midpoint between the acromioclavicular (AC) joint and the olecranon process (center of the elbow) on the posterior aspect of the upper arm. [See Figure C.2.1.2.1(a) and Figure C.2.1.2.1(b).]

*Subscapular* — located on the same diagonal line as the inferior border of the scapula, 2 cm beyond the inferior angle. [See Figure C.2.1.2.1(c) and Figure C.2.1.2.1(d).]

*Pectoral* — Located on a diagonal line, midway between the axillary fold and the right nipple. [See Figure C.2.1.2.1(e) and Figure C.2.1.2.1(f).]

#### C.2.1.2.2 Female Skinfold Sites.

*Triceps* — located at the midpoint between the acromioclavicular (AC) joint and the olecranon process (center of the elbow) on the posterior aspect of the upper arm. [See Figure C.2.1.2.2(a) and Figure C.2.1.2.2(b).]

*Abdominal* — located at the right of the umbilicus, on a vertical fold, 2 cm from the right lateral border. [See Figure C.2.1.2.2(c) and Figure C.2.1.2.2(d).]

*Suprailiac* — located on a diagonal line, 1–2 cm anterior to the crest of the pelvis (ASIS). Grasp a diagonal skinfold just above and slightly forward of the crest of the ilium. [See Figure C.2.1.2.2(e) and Figure C.2.1.2.2(f).]

#### C.2.1.3 Submaximal Graded Treadmill Evaluation (WFI Treadmill Protocol).

- (1) Conduct pre-evaluation procedures.
- (2) The individual being evaluated is instructed to straddle the treadmill belt until it begins to move. At approximately 1 mph, the individual is instructed to step onto the belt and

**Table C.2.1.2(a) Percentage of Body Fat Estimate for Men Based on the Sum of Triceps, Subscapular, and Pectoral Skinfolts**

Skinfolts Sum (mm)	Age up to Last Complete Year								
	Under 22	23-27	28-32	33-37	38-42	43-47	48-52	53-57	Over 57
8-10	1.5	2	2.5	3.1	3.6	4.1	4.6	5.1	5.6
11-13	3	3.5	4	4.5	5.1	5.6	6.1	6.6	7.1
14-16	4.5	5	5.5	6	6.5	7	7.6	8.1	8.6
17-19	5.9	6.4	6.9	7.4	8	8.5	9	9.5	10
20-22	7.3	7.8	8.3	8.8	9.4	9.9	10.4	10.9	11.4
23-25	8.6	9.2	9.7	10.2	10.7	11.2	11.8	12.3	12.8
26-28	10	10.5	11	11.5	12.1	12.6	13.1	13.6	14.2
29-31	11.2	11.8	12.3	12.8	13.4	13.9	14.4	14.9	15.5
32-34	12.5	13	13.5	14.1	14.6	15.1	15.7	16.2	16.7
35-37	13.7	14.2	14.8	15.3	15.8	16.4	16.9	17.4	18
38-40	14.9	15.4	15.9	16.5	17	17.6	18.1	18.6	19.2
41-43	16	16.6	17.1	17.6	18.2	18.7	19.3	19.8	20.3
44-46	17.1	17.7	18.2	18.7	19.3	19.8	20.4	20.9	21.5
47-49	18.2	18.7	19.3	19.8	20.4	20.9	21.4	22	22.5
50-52	19.2	19.7	20.3	20.8	21.4	21.9	22.5	23	23.6
53-55	20.2	20.7	21.3	21.8	22.4	22.9	23.5	24	24.6
56-58	21.1	21.7	22.2	22.8	23.3	23.9	24.4	25	25.5
59-61	22	22.6	23.1	23.7	24.2	24.8	25.3	25.9	26.5
62-64	22.9	23.4	24	24.5	25.1	25.7	26.2	26.8	27.3
64-67	23.7	24.3	24.8	25.4	25.9	26.5	27.1	27.6	28.2
68-70	24.5	25	25.6	26.2	26.7	27.3	27.8	28.4	29
71-73	25.2	25.8	26.3	26.9	27.5	28	28.6	29.1	29.7
74-76	25.9	26.5	27	27.6	28.2	28.7	29.3	29.9	30.4
77-79	26.6	27.1	27.7	28.2	28.8	29.4	29.9	30.5	31.1
80-82	27.2	27.7	28.3	28.9	29.4	30	30.6	31.1	31.7
83-85	27.7	28.3	28.8	29.4	30	30.5	31.1	31.7	32.3
86-88	28.2	28.8	29.4	29.9	30.5	31.1	31.6	32.2	32.8
89-91	28.7	29.3	29.8	30.4	31	31.5	32.1	32.7	33.3
92-94	29.1	29.7	30.3	30.8	31.4	32	32.6	33.1	33.4
95-97	29.5	30.1	30.6	31.2	31.8	32.4	32.9	33.5	34.1
98-100	29.8	30.4	31	31.6	32.1	32.7	33.3	33.9	34.4
101-103	30.1	30.7	31.3	31.8	32.4	33	33.6	34.1	34.7
104-106	30.4	30.9	31.5	32.1	32.7	33.2	33.8	34.4	35
107-109	30.6	31.1	31.7	32.3	32.9	33.4	34	34.6	35.2
110-112	30.7	31.3	31.9	32.4	33	33.6	34.2	34.7	35.3
113-115	30.8	31.4	32	32.5	33.1	33.7	34.3	34.9	35.4
116-118	30.9	31.5	32	32.6	33.2	33.8	34.3	34.9	35.5

the belt speed is increased to 3 mph at 0 percent grade. The individual warms up at 3 mph at 0 percent grade for 3 minutes. During the warm up, the individual is informed that the evaluation is submaximal and will terminate once their monitored heart rate exceeds the target exercise heart rate for 15 seconds. The individual is informed that the target exercise heart rate is 85 percent of their predicted maximal heart rate. The individual is advised that the evaluation is a series of 1-minute exercise stages, alternating between percent grade and speed (i.e., first minute percent grade is increased, second minute speed is increased, etc.). Inform the individual that if at any time during the evaluation they experience chest pain, light-headedness, ataxia, confusion, nausea, or clamminess, they should ask the evaluator to terminate the evaluation.

Start the stopwatch when the treadmill reaches 3 mph at 0% grade. Continue with this speed and grade for 3 minutes (steady state). After completing the 3-minute steady state interval, inform the participant that the speed will increase to 4.5 mph. Advise the participant that the assessment is a series of 1-minute intervals, alternating between speed and percent grade. All subsequent speed increases occur at 0.5 mph. At 4:01

minutes, increase the grade from 0% to 2%. At this time, inform the participant that all subsequent grade increases occur at 2% intervals. The assessment will continue until the participant's heart rate exceeds the THR rate for 15 seconds, or the subject exhibits the medical criteria for early termination. Once the heart rate exceeds the Target Heart Rate (THR), note the time and continue the assessment for an additional 15 seconds. Do not make any changes to the assessment speed or grade during this time. If the participant's heart rate remains above the THR for the full 15 seconds, then stop the assessment and proceed to the cool-down phase. Record the total time, including the 3-minute warm-up, at which point the participant exceeds the THR. If the participant's heart rate exceeds the target, but then drops back to the THR or below within 15 seconds, then the assessment should continue. The assessment is not complete until the participant's heart rate exceeds the THR for 15 seconds. If this does not occur within 18 minutes, then terminate the assessment and record the time. Once the assessment is completed, the time is recorded. The participant should perform a cool-down for a minimum of 3 minutes at 3 mph, 0% grade. Continue to monitor the



**Table C.2.1.2(b) Percentage of Body Fat Estimates for Women Based on the Sum of Triceps, Abdominal, and Suprailiac Skinfolds**

Skinfolds Sum (mm)	Age up to Last Complete Year								
	18-22	23-27	28-32	33-37	38-42	43-47	48-52	53-57	Over 57
8-12	8.8	9	9.2	9.4	9.5	9.7	9.9	10.1	10.3
13-37	10.8	10.9	11	11.3	11.5	11.7	11.8	12	12.2
18-22	12.6	12.8	13	13.2	13.4	13.5	13.7	13.9	14.1
23-27	14.5	14.6	14.8	15	15.2	15.4	15.6	15.7	15.9
28-32	16.2	16.4	16.6	16.8	17	17.1	17.3	17.5	17.7
33-37	17.9	18.1	18.3	18.5	18.7	18.9	19	19.2	19.4
38-42	19.6	19.8	20	20.2	20.3	20.5	20.7	20.9	21.1
43-47	21.2	21.4	21.6	21.8	21.9	22.1	22.3	22.5	22.7
48-52	22.8	22.9	23.1	23.3	23.5	23.7	23.8	24	24.2
53-57	24.2	24.4	24.6	24.8	25	25.2	25.3	25.5	25.7
58-62	25.7	25.9	26	26.2	26.4	26.6	26.8	27	27.1
63-67	27.1	27.2	27.4	27.6	27.8	28	28.2	28.3	28.5
68-72	28.4	28.6	28.7	28.9	29.1	29.3	29.5	29.7	29.8
73-77	29.6	29.8	30	30.2	30.4	30.6	30.7	30.9	31.1
78-82	30.9	31	31.2	31.4	31.6	31.8	31.9	32.1	32.3
83-87	32	32.2	32.4	32.6	32.7	32.9	33.1	33.3	33.5
88-92	33.1	33.3	33.5	33.7	33.8	34	34.2	34.4	34.6
93-97	34.1	34.3	34.5	34.7	34.9	35.1	35.2	35.4	35.6
98-102	35.1	35.3	35.5	35.7	35.9	36	36.2	36.4	36.6
103-107	36.1	36.2	36.4	36.6	36.8	37	37.2	37.3	37.5
108-112	36.9	37.1	37.3	37.5	37.7	37.9	38	38.2	38.4
113-117	37.8	37.9	38.1	38.3	39.2	39.4	39.6	39.8	39.2
118-122	38.5	38.7	38.9	39.1	39.4	39.6	39.8	40	40
123-127	39.2	39.4	39.6	39.8	40	40.1	40.3	40.5	40.7
128-132	39.9	40.1	40.2	40.4	40.6	40.8	41	41.2	41.3
133-137	40.5	40.7	40.8	41	41.2	41.4	41.6	41.7	41.9
138-142	41	41.2	41.4	41.6	41.7	41.9	42.1	42.3	42.5
143-147	41.5	41.7	41.9	42	42.2	42.4	42.6	42.8	43
148-152	41.9	42.1	42.3	42.8	42.6	42.8	43	43.2	43.4
153-157	43.3	42.5	42.6	42.8	43	43.2	43.4	43.6	43.7
158-162	42.6	42.8	43	43.1	43.3	43.5	43.7	43.9	44.1
163-167	42.9	43	43.2	43.4	43.6	43.8	44	44.1	44.3
168-172	43.1	43.2	43.4	43.6	43.8	44	44.2	44.3	44.5
173-177	43.2	43.4	43.6	43.8	43.9	44.1	44.3	44.5	44.7
178-182	43.3	43.5	43.7	43.8	44	44.2	44.4	44.6	44.8

heart rate during the cool-down. Record the recovery heart rate at 1 minute of cool-down.

Record the reason for terminating the assessment and the initial time the THR was exceeded (if applicable). Record time in minutes and convert second(s) into decimal.

See Treadmill Formula and Table C.2.1.3 below. Use the test time (TT) the participant completed the assessment (i.e. exceeded the THR) along with the treadmill conversion formula  $[\text{VO}_2 \text{ max} = 56.981 + (1.242 \times \text{TT}) - (0.805 \times \text{BMI})]$  to estimate  $\text{VO}_2 \text{ max}$ . Record the  $\text{VO}_2 \text{ max}$ .

#### **C.2.1.4 Submaximal Stepmill Evaluation (WFI Stepmill Protocol).**

- (1) Conduct pre-evaluation procedures. Obtain and record individual's age in years and weight in kilograms.
- (2) The individual being evaluated is instructed to assume a starting position about two-thirds of the way up the stairs. The individual is instructed to temporarily grasp the handrails to reduce the possibility of losing balance when the stairs begin to move. The individual is also informed that holding or leaning on the handrails is not allowed once the evaluation begins since this will cause false overestimations of aerobic capacity.

- (3) The assessment starts at level 4 for 2 minutes, then level 5 for 1 minute (warm-up period). Start the stopwatch once the Stepmill begins. Inform the participant that the evaluation is a series of 1-minute intervals with increasing work loads on each subsequent minute. Once the assessment commences, do not allow the participant to hold or lean on the handrails; this will result in overestimation of aerobic capacity. At the completion of the 3 minute-warm-up, proceed to level 7 for 1 minute. \*Note: This is marked by increasing the workload from level 5 to level 7. Once the heart rate exceeds the Target Heart Rate (THR), note the time and continue the assessment for an additional 15 seconds. Do not make any changes to the assessment intensity level during this time. If the participant's heart rate remains above the THR for the full 15 seconds, then the participant has completed the assessment. Stop the assessment and record the time at which the participant exceeded the THR. The total Test Time (TT) begins from the time the participant starts on the Stepmill, to the point at which the participant exceeds their THR. It does not include the final 15 second monitoring period that the heart rate was above the THR. The assessment is complete once the participant's heart rate exceeds the target





FIGURE C.2.1.2.1(a) [Site of Male Skinfold Measurement — Triceps.]



FIGURE C.2.1.2.1(c) [Site of Male Skinfold Measurement — Subscapular.]



FIGURE C.2.1.2.1(b) [Triceps Measurement — Male.]



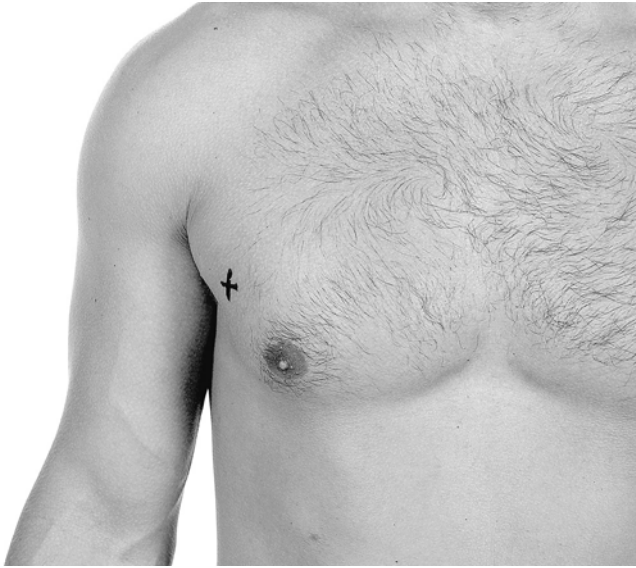
FIGURE C.2.1.2.1(d) [Subscapular Measurement — Male.]

for 15 seconds. If the participant's heart rate exceeds the target, but then drops down to the THR or below within 15 seconds, then the assessment should continue. Once the assessment is completed, the participant will cool down for a minimum of 2 minutes at level 3. Continue to monitor the heart rate during the cool-down. Record the recovery heart rate at one minute of cool-down. The participant may grasp the handrails during the cool-down phase. Upon completion of the cool-down, instruct the participant to grasp the handrails. Stop the stepmill and assist the participant off the apparatus.

**TERMINATE THE ASSESSMENT IF ANY OF THE FOLLOWING OCCURS:**

- (1) The participant's heart rate exceeds THR for 15 seconds.
- (2) The THR has not been met after 16 minutes.
- (3) The participant asks to terminate the exercise.
- (4) The equipment malfunctions.

Medical conditions arise that prohibit completing the assessment. Record the reason for terminating the assessment and the initial time the heart rate had been exceeded (if applicable). Record time in minutes and convert second(s) into decimal (*see Table C.2.1.4*). Insert the test time (TT) at which the participant completed the assessment, along with the stepmill conversion formula to estimate  $\text{VO}_2 \text{ max}$ . Record the  $\text{VO}_2 \text{ max}$ .



**FIGURE C.2.1.2.1(e)** [Site of Male Skinfold Measurement — Pectoral.]



**FIGURE C.2.1.2.1(f)** [Pectoral Measurement — Male.]

Note: TT is the time in minutes that the participant's THR was exceeded and the test terminated Stepmill Submaximal  $\text{VO}_2$  Prediction Formula

$$[\text{VO}_2 \text{ max} = 57.774 + (1.757 \times \text{TT}) - (0.904 \times \text{BMI})]$$

**C.2.1.5 Muscular Strength/Power.** Hand grip strength evaluations shall use the following protocol. The hand grip dynamometer shall be a Jamar Hydraulic Hand dynamometer. [See Figure C.2.1.5.]

(1) Conduct pre-evaluation procedures.

(2) The individual being evaluated is instructed to towel hands to ensure they are dry. The individual is instructed to place dynamometer in the hand to be evaluated; the evaluator adjusts, ensuring that the bottom of the handle clip is adjusted to fit snug in the first proximal interphalangeal joint. The red peak-hold needle is rotated counterclockwise to the zero position. The individual is advised that the evaluation is a series of six measurements — three for each hand. The individual is informed that the isometric contraction (squeezing) required during this evaluation



**FIGURE C.2.1.2.2(a)** [Site of Female Skinfold Measurement — Triceps.]

ation must be eased into and then released slowly, without swinging arm, pumping arm, or jerking hand. Inform the individual that if at any time during the evaluation they experience chest pain, light-headedness, ataxia, confusion, nausea, or clamminess, they should terminate the evaluation.

(3) The individual is instructed to assume a slightly bent forward position, with elbow bent at a 90-degree angle, shoulder adducted and neutrally rotated, forearm and wrist in neutral position.

(4) The individual is instructed to squeeze with maximum strength 2 to 3 seconds while exhaling and then slowly release grip. The peak-hold needle will automatically record the highest force exerted.

(5) Measure both hands alternatively allowing three evaluations per hand. Reset the peak-hold needle to zero before obtaining new readings. List the scores for each hand to the nearest kilogram.

(6) Record the highest score.

**C.2.1.6** Leg strength evaluations shall use the Wellness-Fitness Initiative Protocol for Leg Strength. The leg dynamometer shall be the Jackson Strength Evaluation System or a commercial dynamometer system that is digital, incorporates dead load cells, and includes an adjustable chain, handlebar, and test platform.





FIGURE C.2.1.2.2(b) [Triceps Measurement — Female.]



FIGURE C.2.1.2.2(d) [Abdominal Measurement — Female.]



FIGURE C.2.1.2.2(c) [Site of Female Skinfold Measurement — Abdominals.]

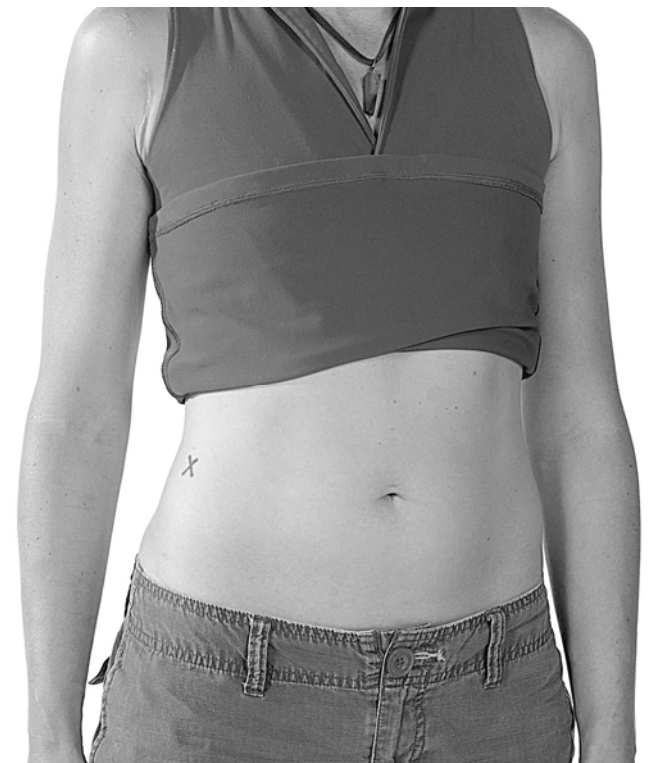


FIGURE C.2.1.2.2(e) [Site of Female Skinfold Measurement — Suprailiac.]

The fire department must verify that the dynamometer is equivalent to the Jackson Strength Evaluation System. A V-grip handle-bar (chinning triangle) is required. [See Figure C.2.1.6.]

- (1) Conduct pre-evaluation procedures.
- (2) The individual being evaluated is instructed to towel hands to ensure they are dry. The individual is advised that the evaluation is a series of three measurements. The individual is informed that the isometric arm contraction required during

this evaluation must be eased into and then released slowly, without swinging arm, pumping arm, or jerking hands. Inform the individual that if at any time during the evaluation they experience back pain, chest pain, light-headedness, ataxia, confusion, nausea, or clamminess, they should terminate the evaluation.

- (3) The individual is instructed to stand upon the dynamometer base plate, which has been placed on a level and secure surface, with feet spread shoulder width apart. The individual is instructed to hold the bar with a wide grip and bend





FIGURE C.2.1.2.2(f) [Suprailiac Measurement — Female.]

their elbows (keeping their elbows to their sides) 90 degrees. Individual must stand erect without arching back.

(4) The instructor verifies that the arm/elbow joint angle is 90 degrees and adjusts the chain so that it is taut in this position.

(5) The individual shall be instructed not to shrug shoulders, bend back, or perform any other motion other than to contract arms and attempt to move the handlebar in a vertical direction.

(6) Instruct the individual to flex arms for a total of 3 seconds.

(7) After 3 seconds, instruct the individual to slowly relax arms and to remain at standing rest for 30 seconds.

(8) Once the individual has completed the 30-second recovery period begin the second evaluation. Repeat evaluation for the third time using the same procedure.

(9) List all scores. Note: Digital readout will display the actual force, the highest peak force, and the average force achieved during the three evaluations.

(10) Record the highest of the three trials to the nearest kilogram.

**C.2.1.7** Arm strength evaluations shall use the following protocol. The arm dynamometer shall be the Jackson Strength

Table C.2.1.3 [Treadmill Assessment]

Time	Speed mph	% grade
0:00 – 1:00	3	0
1:01 – 2:00	3	0
2:01 – 3:00	3	0
3:01 – 4:00	4.5	0
4:01 – 5:00	4.5	2
5:01 – 6:00	5	2
6:01 – 7:00	5	4
7:01 – 8:00	5.5	4
8:01 – 9:00	5.5	6
9:01 – 10:00	6	6
10:01 – 11:00	6	8
11:01 – 12:00	6.5	8
12:01 – 13:00	6.5	10
13:01 – 14:00	7	10
14:01 – 15:00	7	12
15:01 – 16:00	7.5	12
16:01 – 17:00	7.5	14
17:01 – 18:00	8	14
Recovery Phase		
0:00 – 1:00	3	0
1:01 – 2:00	3	0
2:01 – 3:00	3	0

Table C.2.1.4 [Decimal Equivalents for Seconds]

Time (seconds)	Decimal Equivalent	Time (seconds)	Decimal Equivalent	Time (seconds)	Decimal Equivalent
1	0.02	21	0.35	41	0.68
2	0.03	22	0.37	42	0.7
3	0.05	23	0.38	43	0.72
4	0.07	24	0.4	44	0.73
5	0.08	25	0.42	45	0.75
6	0.1	26	0.43	46	0.77
7	0.12	27	0.45	47	0.78
8	0.13	28	0.47	48	0.8
9	0.15	29	0.48	49	0.82
10	0.17	30	0.5	50	0.83
11	0.18	31	0.52	51	0.85
12	0.2	32	0.53	52	0.87
13	0.22	33	0.55	53	0.88
14	0.23	34	0.57	54	0.9
15	0.25	35	0.58	55	0.92
16	0.27	36	0.6	56	0.93
17	0.28	37	0.62	57	0.95
18	0.3	38	0.63	58	0.97
19	0.32	39	0.65	59	0.98
20	0.33	40	0.67	60	1

Evaluation System or a commercial dynamometer system that is digital, incorporates dead load cells, and includes an adjustable chain, handlebar, and test platform. The fire department must verify that the dynamometer is equivalent to the Jackson Strength Evaluation System. A straight-grip handlebar is required. (See Figure C.2.1.7.)

(1) Conduct pre-evaluation procedures.



FIGURE C.2.1.5 [Hand Grip Dynamometer.]

(2) The individual being evaluated is instructed to towel hands to ensure they are dry. The individual is advised that the evaluation is a series of three measurements. The individual is informed that the isometric leg extension required during this evaluation must be eased into and then released slowly, without bending back, swinging arm, pumping or bending arm, or jerking hand. Inform the individual that if at anytime during the evaluation they experience back pain, chest pain, light-headedness, ataxia, confusion, nausea, or clamminess, they should terminate the evaluation.

(3) The individual is instructed to stand upon the dynamometer base plate, which has been placed on a level and secure surface, with feet spread shoulder width apart. The individual is instructed to stand erect. The chain is then adjusted so the upper (inside) edge of the bottom cross member of the V-grip handlebar is at the top of the individual's kneecap. The evaluator verifies this position, ensuring the chain is taut.

(4) The individual is then instructed to hold the bar, look straight with head in the neutral position, fully extend arms, and maintain a straight back. The evaluator shall verify this position and ensure that the individual's hips are directly over their feet, with trunk and knees slightly bent.

(5) Instruct the individual to lift using their legs for a total of 3 seconds.

(6) After 3 seconds, instruct the individual to slowly relax arms and legs and to remain at standing rest for 30 seconds.

(7) Once the individual has completed the 30-second recovery period begin the second evaluation. Repeat the evaluation for the third time using the same procedure.

(8) List all scores. Note: Digital readout will display the actual force, the highest peak force, and the average force achieved during the three evaluations.

(9) Record the highest of the three trials to the nearest kilogram.

#### C.2.1.8 WFI Vertical Jump — Optional Assessment. LEG POWER ASSESSMENT

##### Equipment:

- (1) Pressure Mat — "Just Jump" Probotics



FIGURE C.2.1.6 [Leg Dynamometer.]

- (2) Safety Tape — or any object that can be suspended above the mat to act as a target
- (3) Calculator

##### Assessment:

The purpose of this assessment is to estimate peak power produced in the lower body. Collect the participant's body weight and record in kilograms ( $\# \text{ lbs} \div 2.2 = \text{kg}$ ). Conduct pre-evaluation procedures. Place the jumping mat on a level surface. Connect the cord attached to the jumping mat to the handheld computer port. With the participant off the mat, turn the computer on. Choose "One Jump" on the computer menu. The display should read "Step on Mat." Have the participant squat to a position where the knees are at a  $90^\circ$  angle and the hands by the sides (momentary pause @  $90^\circ$ ) [see Figure C.2.1.8(a)]. Instruct the participant to jump straight up as high as he/she can, reaching toward the ceiling or a target object, without tucking the legs, and land with both feet on the mat [see Figure C.2.1.8(b)]. When the participant has completed the jump, the display will read the hang time and vertical jump in inches. The vertical jump mode resets automatically. Have the participant perform a series of 3 jumps and record the highest distance in inches.



FIGURE C.2.1.7 [Arm Dynamometer.]

Convert the highest jump achieved in inches to centimeters (# inches  $\times$  2.54 = cm). Use the power formula provided below with the jump height (cm) and body weight (kg) to estimate leg power.

Any deviations from the above techniques cannot be counted, and the participant must repeat the trial. The following are examples of situations that require a reevaluation: The participant fails to land with both feet on the mat. The participant tucks the legs instead of extending them while jumping. Note: Administrators can minimize the tendency of participants to tuck the legs by suspending a target object above the mat for the participant to attempt to touch.

Power formula:

Leg Power (watts) =  $[(60.7 \times \text{jump height (cm)}) + (45.3 \times \text{body weight (kg)})] - 2055$

Use the following conversions:

Height in inches to centimeters (# inches  $\times$  2.54 = cm)

Body weight in pounds to kilograms (# lbs  $\div$  2.2 = kg)



FIGURE C.2.1.8(a) [Preparation for Leg Power Assessment.]

**C.2.1.9** Push-up muscle endurance evaluations shall use the Wellness-Fitness Initiative Protocol for Push-ups. Equipment used for this evaluation includes a 5 in. prop (i.e., cup, sponge), a metronome, and a stopwatch.

(1) Conduct pre-evaluation procedures.

(2) The individual is advised that the evaluation is a series of push-ups performed in a 2-minute time period. The individual is advised that the evaluation is initiated from the "up" position (hands are shoulder width apart, back is straight, and head is in neutral position). The individual is informed that they are not allowed to have their feet against a wall or other stationary item. Additionally, the individual is informed that the back must be straight at all times and they must push up to a straight arm position. The individual is instructed to continue performing push-ups in time with the cadence of the metronome, one beat up and one beat down. Inform the individual that if at any time during the evaluation they experience chest pain, light-headedness, ataxia, confusion, nausea, or clamminess, they should terminate the evaluation.



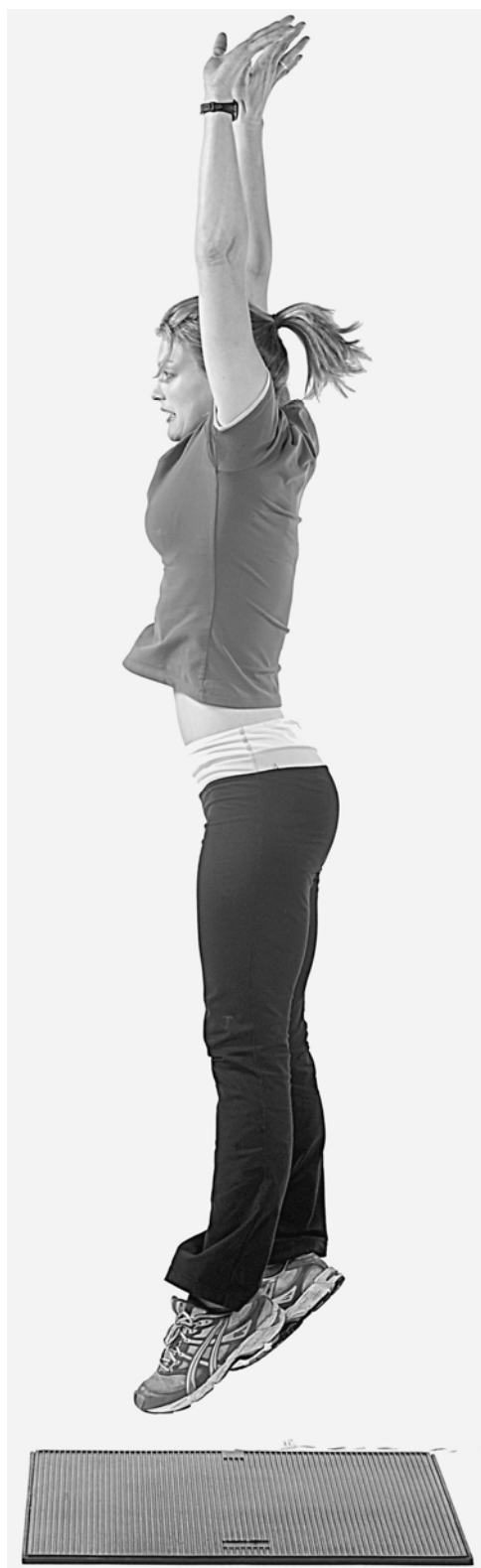


FIGURE C.2.1.8(b) [Vertical Jump.]

(3) The evaluator places the 5-in. prop on the ground beneath the individual's chin and the individual must lower their body to the floor until the chin touches this object. [See Figure C.2.1.9(a) and Figure C.2.1.9(b).]



FIGURE C.2.1.9(a) [“Up” Position for Push-Up.]



FIGURE C.2.1.9(b) [“Down” Position for Push-Up.]

(4) The metronome should be set at a speed of 80, allowing for 40 push-ups per minute.

(5) The individual has a 2-minute time limit to complete a maximum of 80 push-ups.

(6) The administrator shall stop the evaluation when the individual:

- (a) Reaches 80 push-ups
- (b) Performs three consecutive incorrect push-ups
- (c) Does not maintain continuous motion with the metronome cadence

(7) Record the highest number of successfully completed push-ups.

#### C.2.1.10 Optional Assessment: WFI Alternate Grip Push-Up Test.

Equipment: Push-

up handles

Metronome

Stopwatch

Prop – 5”, plus the height of the handles

Assessment:

The purpose of this assessment is to evaluate muscular endurance of the upper body. The alternate grip push-up (with stands) is an optional assessment for participants who experience muscular/skeletal discomfort in the performance of the standard WFI push-up. Conduct the pre-evaluation procedures. Advise the participant that the evaluation is a series of push-ups performed in a 2-minute time period to complete a maximum of 80 push-ups. The evaluation is initiated from the “up” position (hands are shoulder width apart, back is straight, and head is in neutral position). [See Figure C.2.1.10(a).] Advise the participant of the following: It is not

permitted to prop feet against a wall or other stationary object. Back must be straight at all times (neutral position). Arms must be fully extended during the up-phase. Cadence with the metronome must be maintained, (one beat up and one beat down). Instruct the participant to grasp the push up stands, and assume the “up” position. (Caution: hex dumbbells may roll)



**FIGURE C.2.1.10(a) [“Up” Position for Alternate Grip Push-Up.]**

Place the modified prop so that the chin of the participant will contact the prop during the lowering phase. (Prop height = 5” plus the height of stands). [See Figure C.2.1.10(b).] Set the metronome at a speed of 80 bpm, allowing for 40 push-ups per minute for 2 minutes. The assessor shall terminate the evaluation when the participant: Reaches 80 push-ups; Performs three consecutive incorrect push-ups; or Fails to maintain continuous motion with the metronome cadence. Once the assessment is complete, record the highest number of successfully completed push-ups.



**FIGURE C.2.1.10(b) [“Down” Position for Alternate Grip Push-Up.]**

#### **C.2.1.11 WFI Prone Static Plank — Core Stabilization Assessment.**

Equipment:  
Stopwatch  
Exercise Mat  
Assessment:

The purpose of this assessment is to evaluate the muscular endurance of the core stabilizer muscles of the trunk. Conduct the pre-evaluation procedures. Instruct the participant to lay prone, keeping upper body elevated and supported by the elbows. Raise hips and legs off the floor, supporting the body on forearms and toes. Position elbows directly under the shoulders. Maintain straight body alignment from shoulder

through hip, knee and ankle. The ankles should maintain a 90° angle, the scapulae should remain stabilized with elbows at 90°. The spine should remain in a neutral position throughout the assessment. Once the feet are in position, the participant then extends the knees, lifting off the floor. (See Figure C.2.1.11.) Start the stopwatch at this time. Instruct the participant to contract the abdominals so that the back will remain flat in the neutral position for the duration of the assessment. Any deviations from the above posture will warrant 2 verbal warnings. If a 3rd infraction occurs stop the watch and terminate the assessment. The assessor shall terminate the evaluation when the participant: Reaches 4 minutes; or Is unable to maintain proper form after the 2nd warning. Once the assessment termination criteria are met, stop the watch and record the time.



**FIGURE C.2.1.11 [Core Stabilization Assessment.]**

**C.2.1.12** Sit-and-reach flexibility evaluations shall use the Wellness-Fitness Initiative Sit and Reach Protocol. Equipment used for this evaluation shall be a Novel Acuflex I or equivalent trunk flexibility tester that compensates for variable arm and leg lengths.

(1) Conduct pre-evaluation procedures.

(2) The individual is advised that the evaluation is a series of three measurements that will evaluate the flexibility of the lower back, hamstring muscles, and shoulders. The individual is informed that the flexion required during this evaluation must be smooth and slow, as the individual advances the slide on the box to the most distal position possible. Inform the individual that if at anytime during the evaluation they experience back pain, chest pain, light-headedness, ataxia, confusion, nausea, or clamminess, they should terminate the evaluation.

(3) The individual is instructed to sit on the floor ensuring the head, upper back, and lower back are in contact with the wall. The individual is instructed to place legs together, fully extended. The sit and reach box with the sliding measurement guide is placed with the box flat against the feet. [See Figure C.2.1.12(a).]

(4) While maintaining head and upper/lower back contact with the wall, the individual is instructed to extend arms fully in front of their body with the right hand overlaying the left hand, with middle finger of each hand directly over each other. The rule is set to 0.0 in. at the tips of the middle fingers. The individual is then instructed to exhale slowly while stretching slowly forward, bending at the waist, and pushing the measuring device with the middle fingers. During the stretch, legs are to remain together and fully extended and hands are to remain overlaid. [See Figure C.2.1.12(b).] The stretch is held momentarily and the distance obtained. If the individual bounces, flexes knee, or uses momentum to increase distance, the evaluation is not counted.

(5) Instruct the individual to relax for 30 seconds. Once the individual has completed the 30-second recovery period



**FIGURE C.2.1.12(a) [Sit and Reach Flexibility Evaluation — Initial Position.]**



**FIGURE C.2.1.12(b) [Sit-and-Rear Flexibility Evaluation — Forward Position.]**

begin the second evaluation. Repeat evaluation for the third time using the same procedure.

(6) Record the furthest distance from the three trials (rounded to the nearest ¼ in.) as the final score.

**C.2.1.13** Jackson Strength Evaluation System Lafayette Instrument Company Phone: 800-428-7545 or 765-423-1505 Website: [www.licmef.com](http://www.licmef.com)

JAMAR Hydraulic Hand Dynamometer Lafayette Instrument Company Phone: 800-428-7545 or 765-423-1505 Website: [www.licmef.com](http://www.licmef.com)

Novel Acuflex II Trunk Flexibility Tester Novel Products, Inc. Phone: 800-323-5143 E-mail: [www.novelprod@aol.com](mailto:www.novelprod@aol.com)

StairMaster StepMill StairMaster Phone: 888-678-2476 Website: [www.stairmaster.com](http://www.stairmaster.com)

Probotics “Just Jump” Mat Probotics, Inc. Phone: 256-489-9153 Website: [www.probotics.org](http://www.probotics.org) 19

- (1) LifeFitness 9100HR Treadmill: for information and local distributor contact, LifeFitness, 10601 West Belmont Avenue, Franklin Park, IL 60131, Phone (847) 288-3300, fax (847) 288-3791, Website [www.lifefitness.com](http://www.lifefitness.com).
- (2) Jackson Strength Evaluation System with V-Grip Handlebar (chinning triangle): for information and local dis-

tributor contact, Lafayette Instrument, 3700 Sagamore Parkway North, P.O. Box 5729, Lafayette, IN 47903, Phone (765) 423-1505 or (800) 428-7545, fax (765) 423-4111, Website [www.licmef.com](http://www.licmef.com) (Note: The Jackson Strength Evaluation System includes a Jamar Hydraulic Hand Dynamometer).

- (3) Jamar Hydraulic Hand Dynamometer: for information and local distributor contact, Jamar, Sammons Preston, 4 Sammons Court, Bolingbrook, IL 60440, Phone (800) 323-5547 (Note: The Jackson Strength Evaluation System includes a Jamar Hydraulic Hand Dynamometer).
- (4) Novel Acuflex II Trunk Flexibility Tester: for information and local distributor contact, Novel Products Incorporated, Post Office Box 408, Rockton, IL 61072-0408, Phone (800) 323-5143, fax (815) 624-4866, E-mail [novelprod@aol.com](mailto:novelprod@aol.com).
- (5) Polar Heart Rate Monitor: for information and local distributor contact, Polar Electro Inc., 370 Crossways Park Drive, Woodbury, NY 11797, Phone (800) 227-1314; Canada (888) 918-5043, fax (516) 364-5454, Website [www.polarus.com](http://www.polarus.com).
- (6) StairMaster StepMill SM-916 or 7000 PT: for information and local distributor contact, StairMaster Sports/Medical Products, L.P., 12421 Willows Road, NE, Suite 100, Kirkland, WA 98034, Phone (425) 823-1825, ext. 7605, fax (425) 821-3794, Website [www.stairmaster.com](http://www.stairmaster.com).

## Annex D Pregnancy Issues

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

### D.1 Introduction.

**D.1.1** Due to the legal issues associated with pregnancy and employment (see Section D.2), this annex is intended to serve as guidance for the fire department physician in advising the pregnant fire fighter of the risks associated with performing essential job functions and enabling her in decision-making. This has been summarized in an informational handout developed by the Task Group for the pregnant fire fighter (see A.9.18.2).

**D.1.2** The majority of pregnant fire fighters will be able to continue to work throughout pregnancy, with some accommodations. A point will likely come during the pregnancy when the physical changes to the body of the pregnant fire fighter will impair her ability to perform some of the essential job tasks, and appropriate restrictions will need to be offered.

### D.2 Legal Framework.

**D.2.1** This document does not constitute legal advice. Before developing a pregnancy policy or before restricting or suspending a pregnant fire fighter against her will, fire physicians and the AHJ should seek competent legal advice.

**D.2.2** The Pregnancy Discrimination Act of 1978 states that discrimination on the basis of pregnancy or childbirth constitutes unlawful sex discrimination under Title VII of the Civil Rights Act of 1964 [1]. Women who are pregnant or have related conditions must be treated in the same manner as other applicants or employees with similar abilities or limitations. An employer may not force a pregnant employee to take disability leave if she is able to work and cannot remove her from her duty assignment if she is able and willing to perform it. The



Pregnancy Discrimination Act applies to most employers that have 15 or more employees.

**D.2.3** The U.S. Supreme Court ruled in 1991 that an employer may not exclude pregnant women from hazardous jobs [2]. Therefore, assuming the pregnant fire fighter is willing and able to perform her essential job tasks, fire agencies should give options to pregnant fire fighters, but ultimately it is up to the individual fire fighters to decide, after consultation with their personal physicians, whether to accept a light duty assignment or other reasonable changes in their job assignments.

**D.3** The pregnant fire fighter can be exposed to the following hazards associated with adverse outcomes to the pregnancy or damage to the fetus:

- (1) Physical hazards, including heat, trauma, radiation, and noise.
- (2) Chemical hazards, including exposure to carbon monoxide, other products of combustion (e.g., hydrogen cyanide, acrolein, formaldehyde, benzene, acetaldehyde, formic acid), heavy metals, and organic solvents.
- (3) Biological hazards. As first responders, fire fighters are at a higher risk of exposure to infectious agents. Pregnancy by itself does not increase that risk. However, with some agents (e.g., novel H1N1 influenza), the risk of complications is higher during pregnancy. Pregnant fire fighters should be aware of these risks and follow good hygiene principles.

#### **D.4 Physical Hazards.**

##### **D.4.1 Trauma.**

**D.4.1.1** The uterus extends out of the protection of the pelvis after 13 weeks and is therefore more susceptible to direct trauma (to the uterus or the fetus) after that gestational point [3].

**D.4.1.2** Fetal mortality due to nonuterine trauma is increased during the first 23 weeks, possibly due to higher susceptibility to maternal hypotension during the first and second trimesters [4,5].

**D.4.1.3** With blunt trauma, the leading causes of fetal death are maternal shock, abruption, and uterine rupture [3]. Direct fetal injury from blunt trauma is rare [5].

**D.4.1.4** Fetal mortality rates due to maternal trauma [3]:

- (1) Overall with major trauma: 40 percent to 65 percent [4,5,6]
- (2) Overall with minor trauma: 1 percent to 5 percent [3,5]
- (3) In case of maternal pelvic fracture: 25 percent to 35 percent [5,7]
- (4) Gunshot wound to abdomen: 30 percent to 50 percent [5]

**D.4.1.5** Long-term outcomes after trauma, besides fetal loss, include higher risk of preterm labor and placental bleeding [5]. The risks of preterm labor and low birth weight were found to be nearly double in a series of patients discharged from a trauma center [8].

**D.4.1.6** Pregnant fire fighters should be encouraged to wear seat belts. Proper seat belt positioning during pregnancy should be taught (lap belt under the abdomen and shoulder harness between the breasts); improper placement can result in uterine rupture [3,5]. Seat belt use significantly reduced fetal mortality (fivefold reduction) in a series of cases of pregnant patients injured in motor vehicle accidents [9].

**D.4.1.7** Standard personal protective equipment is not designed to protect the fetus. The personal protective equipment fitted pre-pregnancy might not offer the same level of protection during pregnancy.

**D.4.2 Noise.** Noise exposure during pregnancy has been associated, in human studies, with several adverse outcomes, including miscarriage [10,11], intrauterine growth retardation [11,12,13], preterm delivery [11,14], hearing loss in babies and children [15,16], and hypertension in pregnancy [11]. In a review of 10 studies on pregnancy and noise, most studies did not achieve statistical significance in showing negative effect of noise [17]. The safe threshold of noise exposure during pregnancy is unknown [18]. (*See D.11.1.*)

**D.4.3 Shift Work.** Alternating shift work and night work have been associated with preterm birth [24,25], miscarriage [26] and lower birth weight [25,27]. Existing research is controversial. (*See D.11.2.*)

**D.4.4 Heat.** In animal studies, increase in maternal core temperature over 1.5°C has been shown to be teratogenic [30]. Core temperature has been shown to be up to 39°C in training [31,32]. Hyperthermia creates the highest risk during the first two months of pregnancy [33,34]. Sports Medicine Australia recommends a pregnant woman “to avoid exercise in hot conditions” [33]. Exercising in a warm environment should be limited, and adequate hydration should be maintained with physical activity.

**D.4.5 Physical Activity.** Prolonged working hours, heavy lifting, prolonged standing, and heavy physical workload have been associated with preterm birth, lower birth weight, and pre-eclampsia [14,28]. (*See D.11.3.*)

**D.4.6 Radiation.** Fire fighters assigned to patient transport via aircraft or other high-altitude aviation may encounter radiation exposure of significance to a fetus [35,36]. (*See D.11.4.*)

#### **D.5 Chemical Hazards.**

**D.5.1 Carbon Monoxide.** Carbon monoxide exposure during pregnancy is associated with miscarriage, malformations, mental retardation, and low birth weight [32,38,39].

**D.5.2 Products of Combustion.** Other chemicals toxic to the fetus that are found in products of combustion include benzene, acrolein, formaldehyde, hydrogen cyanide, acetaldehyde, chloroform, and formic acid [32,38,39]. Both fire suppression and overhaul phases can expose firefighters to toxic chemicals [40].

**D.5.3 Exposure to Lead and Other Metals.** Lead exposure during pregnancy is associated with serious materno-fetal complications, including miscarriage, premature rupture of membranes, pre-eclampsia, hypertension, and neurobehavioral effects in infants and children [41,42,43]. Even at low levels, lead exposure has been associated with preterm delivery; congenital abnormalities [44]; and decreased birth weight, length, and head circumference [45]. Current research suggests that there is no safe lead exposure threshold to children, infants, and fetuses [43,46,47]. (*See D.11.5.*)

**D.5.4 Exposure to Organic Solvents.** Some organic solvents, like xylene, might be harmful to the fetus [18].

**D.5.5 Other Chemicals.** Clandestine drug laboratories and hazardous-material scenes should be avoided. Clandestine drug laboratories can expose fire fighters to a variety of toxic chemicals, some of which are potentially injurious to the fetus

[49]. Extensive exposure to exhaust fumes might be dangerous because of exposure to carbon monoxide, benzene, and other organic solvents from motor vehicles. In the United States, gas used for regular road traffic does not contain benzene. In developing countries that use leaded gasoline, lead exposure can be significant problem for fire fighters exposed to exhaust fumes [52].

**D.6 Medical Issues.** The American College of Obstetricians and Gynecologists has published a list of medical contraindications to exercise during pregnancy[53] [Exercise during pregnancy and the postpartum period. ACOG Committee. Opinion No. 267. <http://mail.ny.acog.org/website/SMIPodcast/Exercise.pdf>]. That list could be used to recommend work accommodation to pregnant fire fighters who are suffering from specific complications.

**D.7 Risks by Trimesters.** Table D.7 lists risks by trimester and during lactation.

#### **D.8 Recommended Activity Modifications During Pregnancy.**

**D.8.1** The following activities are not recommended during the entire pregnancy:

- (1) Exposure to excessive heat
- (2) Hazmat assignment, exposure to products of combustion or toxic chemicals
- (3) Use of encapsulating protective gear
- (4) Exposure to ionizing radiation [18,35]
- (5) Exposure to prolonged vehicular exhaust or high-volume vehicular traffic (*see D.8.1.1*)
- (6) Aviation (including helicopter) unit assignment [18,35,36,37]

##### **D.8.1.1 Recommendations by Trimester.**

- (1) First trimester:
  - (a) Modified, nonhazardous duty only if requested by the fire fighter in consultation with her personal (treating) physician.
  - (b) The fire physician should ensure that the fire fighter and her treating physician are aware of risks created by the job assignment.
  - (c) All recommendations stated in D.8.1
- (2) Second trimester:
  - (a) An accommodation for maternity uniform may be needed.

- (b) The following are not recommended:
  - i. Assignments with alternating shift work
  - ii. Heavy lifting and prolonged standing
- (c) All recommendations stated in D.8.1

#### **(3) Third trimester:**

- (a) The fire fighter may have to be taken off hazardous duties if she is unable to perform the required job functions due to issues with balance, speed, or agility. She should be given a modified duty assignment.
- (b) An accommodation for maternity uniform may be needed.
- (c) The following are not recommended:
  - i. Assignments with alternating shift work
  - ii. Heavy lifting and prolonged standing
- (d) All recommendations stated in D.8.1

#### **D.9 Post-Delivery: Return to Work.**

**D.9.1** Because of different types of deliveries and associated complications, return-to-work decisions should be based upon an individualized evaluation of the fire fighter's current status and the requirements of her work assignment. (*See D.11.6*)

**D.9.2** Once the fire fighter requests to return to full duty with the consent of her treating health care provider, all restrictions for patrol duty and training should be lifted, unless other medical issues are present.

**D.9.3** The physician should consider various issues such as the following [55]:

- (1) Delivery trauma and mode of delivery
- (2) C-section healing (*See D.11.7*)
- (3) Physical deconditioning, fatigue, and lack of sleep
- (4) Musculoskeletal conditions (e.g., back pain, carpal tunnel syndrome, tendonitis)
- (5) Pregnancy-related issues
  - (a) Hypertension
  - (b) Eclampsia
  - (c) Gestational diabetes
  - (d) Post-partum depression
  - (e) Post-partum thyroiditis
  - (f) Deep venous thrombosis
  - (g) Anemia
  - (h) Other complications

**Table D.7 Risks by Trimester and During Lactation**

	First Trimester	Second Trimester	Third Trimester	Lactation
Trauma	The risk of direct fetal trauma is mitigated due to the location of uterus, which is a pelvic organ in the first trimester.	The risk of direct fetal trauma is increased due to the intra-abdominal position after 13 weeks.	The risk of direct fetal trauma is increased due to the intra-abdominal position after 13 weeks.	No additional risk.
Chemicals	Avoid exposure to heavy metals, hydrocarbons, carbon monoxide.	Avoid exposure to heavy metals, hydrocarbons, carbon monoxide.	Avoid exposure to heavy metals, hydrocarbons, carbon monoxide.	Avoid exposure to heavy metals, hydrocarbons, carbon monoxide.
Other risks	Heat, noise, radiation, shift work, infections.	Heat, noise, radiation, shift work, infections.	Heat, noise, radiation, shift work, infections.	No additional risk.



**D.10 Post-Delivery: Lactation.**

**D.10.1** Fire fighters who are breastfeeding should avoid unprotected exposure to toxic levels of heavy metals and other chemicals.

**D.11 Notes.**

**D.11.1** Intrauterine measurements showed that the fetus was not significantly protected against loud noises [19]. One study in human volunteers found a maximal intrauterine noise attenuation of 10 dB at 4000 Hz [20]. In a study of ewes, the noise attenuation was 20 dB at 4000 Hz, but low-frequency sounds less than 250 Hz were 2 to 5 greater inside the uterus [21]. The sound of a siren can reach up to 110 dB inside the cab of an emergency vehicle [22,23]. The Navy and Marine Corps Public Health Center makes the following recommendations:

“1. The ACGIH [American Conference of Governmental Industrial Hygienists] 115 dBC TWA [time weighted average] and peak 155 dBC noise notations should be observed as exclusion criteria starting at 20 weeks gestation. Excluding pregnant women from discharging firearms after 20 weeks gestation would be consistent with those criteria.

2. Pregnant workers should be vigilant in wearing hearing protectors whenever environmental noise exceeds 84 dBA, to minimize potentially unhealthy maternal cardiovascular and endocrine effects on the growing fetus.

3. Extended exposures (more than 12 minutes) above 104 dBA should be avoided after 20 weeks gestation, even with the use of maternal hearing protection.

4. Impact/impulse noise exposure sufficient to require personal hearing protection should be avoided” [18].

**D.11.2** In a review of studies on pregnancy and shift work, 8 out of 12 studies showed a significant (but usually small) adverse effect of alternating shift work on pregnancy [17]. In a meta-analysis of 17 studies of shift work during pregnancy, the authors found a significant but small (relative risk 1.2) effect of shift work on preterm delivery; but no association between shift work and birth weight [28]. In a meta-analysis of 4 studies of pregnancy among nurses, shift work was significantly associated with a slightly increased risk of miscarriage [29].

**D.11.3** In a meta-analysis of 53 studies of occupational exposures (prolonged working hours, shift work, lifting, standing and heavy physical workload) during pregnancy, the authors found a significant but small effect of long working hours (beyond 40 hours a week) on preterm birth; and a significant but small effect of prolonged standing (more than 3 hours day) on preterm birth. The influence of these occupational exposures on pre-eclampsia is less clear [28].

**D.11.4** Aviation-related (including helicopters) potential hazards for the fetus include vibration, noise, jet fuel and altitude [18,37].

**D.11.5** Inorganic lead is absorbed by inhalation and ingestion. Blood absorption of inhaled lead is 30-40%, and blood absorption of ingested lead is 5-15%. Lead is then mostly stored in bones. The half-life of lead is 1 to 3 months in blood and soft tissues and 10 to 25 years in bones. Lead crosses the placenta and is transmitted from the mother to the fetus. Lead is excreted mainly through the kidneys and gastrointestinal tract. Lead is also excreted in breast milk [42,43,48].

**D.11.6** Sports Medicine Australia recommends waiting for up to 6 weeks after delivery before performing intense physical exercises [54].

**D.11.7** In a series of 100 patients with complications after a C-section, the most common complications were endomyometritis (63 patients), wound infection (32 patients), wound

hematoma (22 patients) and postpartum hemorrhage (12 patients). Wound dehiscence was seen in 4 patients. All complications were seen within 10 days of the surgery [56]. Sports Medicine Australia recommends waiting for 6 weeks after C-section to resume exercising [54].

**D.12 Pregnancy References.**

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## Annex E Sample Physician Evaluation Form for Fire Fighters with Diabetes

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

E.1 Figure E.1 is a form that will assist physicians in the evaluation of individuals with diabetes mellitus against their ability to safely perform the essential job functions of a fire fighter.



## PHYSICIAN EVALUATION FORM FOR FIRE FIGHTERS WITH DIABETES MELLITUS

You are being asked to evaluate an individual for a position as a fire fighter (FF). It is essential that the FF undergo an individualized assessment of his or her diabetes to determine whether the individual's condition permits safe and effective job performance. This evaluation is based on the guidance established by the NFPA Technical Committee on Occupational Safety and Health in consultation with representatives of the American Diabetes Association. The relevant sections of these guidelines are listed below in bold, followed by the information needed to assess whether the individual meets these guidelines.

### I. Introduction

The educated and motivated FF or FF applicant with well-managed diabetes mellitus can be capable of safe and effective job performance. An individualized assessment of the FF's or FF applicant's diabetes should be performed, including an assessment of the following:

- History of blood glucose control
- Current stability of blood glucose
- Risk for significant hypoglycemia or hyperglycemia
- Presence of diabetic complications
- Knowledge of diabetes and its management

Risk of hypoglycemia remains the major concern in regard to those with diabetes being or becoming a FF. This risk occurs primarily in those taking insulin, particularly those with type 1 diabetes, although it may also occur in those with type 2 diabetes who take insulin and/or sulfonylureas and other secretagogues.

Fire fighting entails a unique set of conditions that need to be considered in regard to those with diabetes and the risks of either hypo or hyperglycemia. These may include (depending upon the duties of the particular FF position):

- unpredictable periods of maximal physical exertion (e.g., climbing stairs with over 50 pounds of PPE and 20 to 40 pounds of equipment);
- use of encapsulating and insulated personal protective equipment (PPE) that can result in significant fluid loss and dehydration;
- exposure to extreme environmental temperatures;
- during emergency responses with limited access to food, water, and medications for prolonged periods of time;
- emergency response driving with the responsibility for others in the vehicle;
- critical, time-sensitive complex problem solving in hazardous environments;
- unpredictable meal schedules;
- control of one's emotions under stress;
- functioning as a team where sudden incapacitation can result in mission failure or risk of injury or death to civilians or other team members.

**FIGURE E.1 Physician Evaluation Form.**

## II. Assessment

- FF has been under the care of an endocrinologist or other physician knowledgeable about diabetes management. Outpatient and in-patient medical record(s) of the last three years or since date of diagnosis (whichever is shorter) should be reviewed by the treating physician and provided to the fire department physician.

*My credentials as a physician knowledgeable about diabetes management are as follows (or attach CV):*

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*This person has*    ☐ *type 1 diabetes*    ☐ *type 2 diabetes*

**Date of diagnosis:** \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

*Attach records for prior 3 years or since onset of diabetes whichever is shorter for*

☐ *out-patient treatment*    ☐ *in-patient treatment*

- If type 1 diabetes, has been on a basal/bolus regimen or an insulin pump using analogue insulins for the six (6) months prior to evaluation<sup>1,2</sup>

Current insulin regimen:

**Insulin pump brand and model:** \_\_\_\_\_

Pump settings:

Start Time					
Basal Rate					
Start Time					
Basal Rate					

Usual Bolus doses:

Breakfast \_\_\_\_\_

Lunch \_\_\_\_\_

Supper \_\_\_\_\_

Other \_\_\_\_\_

Correction factor:

*Multiple dose insulin (specify regimen)*

*Basal:* \_\_\_\_\_

*Bolus:* \_\_\_\_\_

**Starting date on current regimen:** \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

FIGURE E.1 *Continued*





3. If type 2 diabetes on insulin, has been on a stable medication regimen for the three (3) months prior to evaluation.<sup>3</sup> If on oral agents alone, should be on a stable medication regimen for one month prior to evaluation.<sup>4</sup>

Current medication regimen:

oral agents	insulin
_____	_____
_____	_____
_____	_____
_____	_____

Starting date on current regimen: \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_

4. Has documentation of ongoing self-monitoring of blood glucose. This must be done with a glucose meter that stores every reading, records date and time of reading and from which data can be downloaded. Monitoring records must be available covering the time periods (1, 3, or 6 months), as described in Sections 2 and 3, following a schedule acceptable to the fire department physician.<sup>5</sup>

*The individual has been asked to test glucose \_\_\_\_\_ times a day, and*

- ☐ *IS adhering to my recommended schedule for testing.*  
☐ *is NOT adhering to my recommended schedule for testing.*

*Glucose logs*

- ☐ *are attached for review*  
☐ *are not attached for review (please explain)*

5. Has been educated in diabetes and its management and thoroughly informed of and understands the procedures that must be followed to monitor and manage his/her diabetes and what procedures should be followed if complications arise.<sup>6</sup>

*The individual has completed the following diabetes education (include year of completion):*

\_\_\_\_\_  
 \_\_\_\_\_

6. If an insulin pump user, documents
- proper understanding and education in the use of the insulin pump
  - start date for the use of the pump
  - history of insulin site infections
  - history of pump cessation and pump malfunction
  - backup plan for pump malfunction, including use of injectable insulin
  - frequency of infusion set changes

*The individual as completed the following education in the use of a continuous insulin infusion pump (indicate year of completion):*

\_\_\_\_\_  
 \_\_\_\_\_

FIGURE E.1 *Continued*

*The individual routinely carries appropriate supplies to compensate for pump malfunction, including syringes and insulin vials or insulin pens.*

☐ Yes    ☐ No — please explain

*The individual has had more than one pump site infection that caused him/her to miss work or usual daily activities in the preceding six months.*

☐ Yes — please explain    ☐ No

7. Has had hemoglobin A1C measured at least four times (intervals of two to three months) over the 12 months prior to evaluation if diagnosis has been present over a year.<sup>7,8</sup>

<i>Date</i>	<i>HbA1C</i>
_____	_____
_____	_____
_____	_____
_____	_____

8. If the individual's A1C was found to be 8% or above on one or more occasions, has the validity of that level been confirmed by a second determination?

☐ Yes    ☐ No (please explain)

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---



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9. If the second determination specified above was done, is there reason to suspect that the original A1C level(s) overestimates average blood glucose?

☐ Yes    ☐ No

10. Incapacitating events — Has not had any within the past one (1) year and no more than two (2) episodes in the past three (3) years, or since diagnosis of diabetes (whichever is shorter) of

- severe hypoglycemia (loss of consciousness, seizures or coma, requiring the assistance of others or needing urgent treatment [glucose injection or IV glucose]) or
- a blood sugar < 60 mg/dl with unawareness<sup>9</sup> demonstrated in current glucose logs.

*Has this individual had an episode of hypoglycemia as described above?*

☐ Yes    ☐ No

*If the individual has had such episode(s), please describe episodes and provide dates or episodes*

---



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11. Has had a complete eye exam by a qualified ophthalmologist or optometrist, including a dilated retinal exam, demonstrating no more than mild background diabetic retinopathy.<sup>10</sup>

*Copy of ophthalmology or optometry report is attached*

☐ Yes    ☐ No (please explain)

FIGURE E.1 *Continued*



12. Has normal vibratory testing with 128 Hz tuning fork, has normal testing with 10 gram Semmes-Weinstein monofilament<sup>11</sup> and normal orthostatic blood pressure and pulse testing.<sup>12</sup>

Vibration sensation: \_\_\_\_\_

Monofilament: \_\_\_\_\_

BP supine: \_\_\_\_\_

Pulse supine: \_\_\_\_\_

BP standing: \_\_\_\_\_

Pulse standing: \_\_\_\_\_

13. Has normal cardiac physical exam and normal cardiac stress testing to at least 12 METS. Annual cardiac stress testing<sup>13</sup> should begin when any of the following criteria are met:

- age greater than 35 years
- Type 1 DM greater than 15 years duration
- Type 2 DM greater than 10 years duration
- signs of target organ damage (eyes, kidney, autonomic, cardiac)
- any other coronary artery disease risk factors

Copy of stress test report performed within the last 12 months is attached:

☐ Yes    ☐ No (please explain)

14. Has normal renal function based on albumin/creatinine ratio  $\leq 30:1$ , and measured or calculated creatinine clearance  $>60$  ml/min.<sup>14</sup>

Serum Creatinine: \_\_\_\_\_

Calculated creatinine clearance (Specify method): \_\_\_\_\_

☐ Cockcroft Gault or

☐ MDRD

Urine microalbumin/creatinine ratio: \_\_\_\_\_

### III. Treating Physician Statement

The above-named individual meets all of the criteria provided on this form:

☐ Yes — It is my opinion that the above-named individual is well-educated and well-motivated in diabetes self-management and has achieved a level of diabetes management to be capable of safe and effective job performance as a fire fighter.

I have reached this opinion after careful review of the above criteria.

☐ No — not recommended for position

☐ No, but IS recommended for position (letter of explanation attached)

Signature of Physician \_\_\_\_\_

Date \_\_\_\_\_

Printer or Typed Name of Physician \_\_\_\_\_

Phone Number \_\_\_\_\_

FIGURE E.1 *Continued*



## References

- <sup>1</sup> Times cited for durations of stable treatment regimen or stability of management are in reference to the date of current evaluation for a fire fighter position.
- <sup>2</sup> Date sought is when patient first began current insulin regimen (pump or injection) using current types of insulin (long acting, intermediate acting, short or rapid acting). A stable insulin regimen is defined as maintaining the same types of insulin (long acting, intermediate acting, short or rapid acting). Changes in insulin amount are part of the appropriate self-management of diabetes and do not disqualify an applicant or incumbent under this section.
- <sup>3</sup> Date sought is when patient first began current insulin or oral agent regimen defined as when patient began using current types of insulin or classes of oral medication. A stable insulin regimen is defined as maintaining the same types of insulin (long acting, intermediate acting, short or rapid acting). Changes in insulin amount are part of the appropriate self-management of diabetes and do not disqualify an applicant or incumbent under this section.
- <sup>4</sup> Changes in dose within the evaluation period will be allowed but addition of a new class of medications or insulin should result in a new period of observation:
  - one month for addition of a sulfonylurea or metformin
  - two months for addition of a thiazolidinedione to insulin or a sulfonylurea
  - three months for the addition of insulin.
- <sup>5</sup> Testing schedules are individual. What follows is a common pattern. Individual patterns may differ.

Therapeutic Regimen	Glucose Testing Schedule
Diet alone	Once or twice a week
Metformin, Thiazolidinediones, or Alpha Glucosidase inhibitors alone or in combination	Once or twice a week
Sulfonylureas, meglitinides, nateglinide — alone or in combination with the above group	Twice a day — AM and at supper; with any suspected hypoglycemic episodes
Insulin — one shot in combination with orals	Twice a day AM and at supper, with any suspected hypoglycemic episodes. 2–3 AM once a week
Insulin — two or more shots, Insulin pump	3 to 4 times a day — at meals and bedtime. 2–3 AM once a week; with any suspected hypoglycemic episodes

- <sup>6</sup> See [http://care.diabetesjournals.org/cgi/content/full/28/suppl\\_1/s72](http://care.diabetesjournals.org/cgi/content/full/28/suppl_1/s72)
- <sup>7</sup> See [http://care.diabetesjournals.org/cgi/content/full/27/suppl\\_1/s91](http://care.diabetesjournals.org/cgi/content/full/27/suppl_1/s91)
- <sup>8</sup> If Hemoglobin A1C > 8% this may signal a problem with diabetes management that warrants further assessment.
- <sup>9</sup> See [http://care.diabetesjournals.org/cgi/content/full/28/suppl\\_1/s61](http://care.diabetesjournals.org/cgi/content/full/28/suppl_1/s61)
- <sup>10</sup> No more than one dot, blot, or flame-shaped hemorrhages or microaneurysm in all four fundus quadrants. [http://www.iceh.co.uk/journal/46\\_04.asp](http://www.iceh.co.uk/journal/46_04.asp)
- <sup>11</sup> See [www.med.umich.edu/mdrtc/textonly/educmats/MNSI\\_howto.doc](http://www.med.umich.edu/mdrtc/textonly/educmats/MNSI_howto.doc)
- <sup>12</sup> Orthostatic hypotension is a physical finding defined by the American Autonomic Society and the American Academy of Neurology as a systolic blood pressure decrease of at least 20 mm Hg or a diastolic blood pressure decrease of at least 10 mm Hg within three minutes of standing. <http://www.aafb.org/afp/20031215/2393.html>
- <sup>13</sup> See Gibbons, et al. [2002]. ACC/AHA 2002 guideline update for exercise testing: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation* 106(14):1883–1892.
- <sup>14</sup> See [http://care.diabetesjournals.org/cgi/content/full/27/suppl\\_1/s79](http://care.diabetesjournals.org/cgi/content/full/27/suppl_1/s79). GFR calculator: [www.nephron.com/mdrd/default.html](http://www.nephron.com/mdrd/default.html).

FIGURE E.1 *Continued*



## Annex F Informational References

**F1 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.

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## Sequence of Events Leading to Issuance of this NFPA Committee Document

### Step 1: Call for Proposals

- Proposed new Document or new edition of an existing Document is entered into one of two yearly revision cycles, and a Call for Proposals is published.

### Step 2: Report on Proposals (ROP)

- Committee meets to act on Proposals, to develop its own Proposals, and to prepare its Report.
- Committee votes by written ballot on Proposals. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Proposals (ROP) is published for public review and comment.

### Step 3: Report on Comments (ROC)

- Committee meets to act on Public Comments to develop its own Comments, and to prepare its report.
- Committee votes by written ballot on Comments. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Comments (ROC) is published for public review.

### Step 4: Technical Report Session

- “*Notices of intent to make a motion*” are filed, are reviewed, and valid motions are certified for presentation at the Technical Report Session. (“Consent Documents” that have no certified motions bypass the Technical Report Session and proceed to the Standards Council for issuance.)
- NFPA membership meets each June at the Annual Meeting Technical Report Session and acts on Technical Committee Reports (ROP and ROC) for Documents with “certified amending motions.”
- Committee(s) vote on any amendments to Report approved at NFPA Annual Membership Meeting.

### Step 5: Standards Council Issuance

- Notification of intent to file an appeal to the Standards Council on Association action must be filed within 20 days of the NFPA Annual Membership Meeting.
- Standards Council decides, based on all evidence, whether or not to issue Document or to take other action, including hearing any appeals.

## Committee Membership Classifications

The following classifications apply to Technical Committee members and represent their principal interest in the activity of the committee.

- M *Manufacturer:* A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.
- U *User:* A representative of an entity that is subject to the provisions of the standard or that voluntarily uses the standard.
- I/M *Installer/Maintainer:* A representative of an entity that is in the business of installing or maintaining a product, assembly, or system affected by the standard.
- L *Labor:* A labor representative or employee concerned with safety in the workplace.
- R/T *Applied Research/Testing Laboratory:* A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.
- E *Enforcing Authority:* A representative of an agency or an organization that promulgates and/or enforces standards.
- I *Insurance:* A representative of an insurance company, broker, agent, bureau, or inspection agency.
- C *Consumer:* A person who is, or represents, the ultimate purchaser of a product, system, or service affected by the standard, but who is not included in the *User* classification.
- SE *Special Expert:* A person not representing any of the previous classifications, but who has a special expertise in the scope of the standard or portion thereof.

#### NOTES:

1. “Standard” connotes code, standard, recommended practice, or guide.
2. A representative includes an employee.
3. While these classifications will be used by the Standards Council to achieve a balance for Technical Committees, the Standards Council may determine that new classifications of members or unique interests need representation in order to foster the best possible committee deliberations on any project. In this connection, the Standards Council may make appointments as it deems appropriate in the public interest, such as the classification of “Utilities” in the National Electrical Code Committee.
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