MEMORANDUM

TO: NFPA Technical Committee on Fire Service Occupational Safety and Health
FROM: Ken Holland, Staff Liaison
DATE: October 17, 2011
SUBJECT: NFPA 1582 ROC TC Letter Ballot (A2012 Cycle)

The ROC letter ballot for NFPA 1582 is attached. The ballot is for formally voting on whether or not you concur with the committee’s actions on the comments. Reasons must accompany all negative and abstention ballots.

Please do not vote negatively because of editorial errors. However, please bring such errors to my attention for action.

Please complete and return your ballot as soon as possible but no later than Monday, October 31, 2011. As noted on the ballot form, please return the ballot to Yvonne Smith either via e-mail at vsmith@nfpa.org or via fax to 617-984-7056. You may also mail your ballot to the attention of Yvonne Smith at NFPA, 1 Batterymarch Park, Quincy, MA 02169.

The return of ballots is required by the Regulations Governing Committee Projects.

Attachments: Comments
Letter Ballot
Comment on Proposal No.: 1582-18
Recommendation: Revise text to read as follows:

6.8.1.1 A candidate who has in the past required bronchodilator..."

(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. Information gained from direct bronchial provocation testing using methacholine and histamine, which act directly on smooth muscle to cause constriction and airway narrowing, is not equivalent to the information gained from indirect bronchial provocation. A negative response to the direct pharmacological challenges (methacholine, histamine) cannot be used to exclude exercise induced asthma. Furthermore, bronchial hyperresponsiveness to these agents is not necessarily specific to a diagnosis of asthma and bronchial hyperresponsiveness has been shown in many healthy people in response to histamine. Another limitation of the direct BPT is the arbitrary nature of the cut-off values used to identify a positive response.

New South Wales Police and Australian Defence Force for the same reasons articulated above, now use indirect bronchial provocation tests where indicated in their recruitment processes. (Please note that the information in the reference below in relation to the Australian Defence Force is now dated).

The following reference goes into clear detail of the issues of bronchial provocation tests for identifying asthma and makes a very good case for the use of indirect bronchial provocation tests applicable to our context. The above is based largely on this paper which summarises the issue so well. The second author, Sandra Anderson is prolific in her work in this area.


Note: Supporting material is available for review at NFPA Headquarters.

This is not original material; its reference/source is as follows:

Committee Meeting Action: Accept in Principle in Part

Revise text to read as follows:

6.8.1.1 A candidate who has in the past required bronchodilator..."

(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.

Committee Statement: The committee does agree that mannitol and hypertonic saline are acceptable provocative challenges for such testing, as were the originals.
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. Hemiparalysis 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 epileptic conditions including single unprovoked seizures, simple partial, complex partial, generalized, and psychomotor seizure disorders other than as allowed in 6.15.1.1
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

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 6.15.1.2(1) through 6.15.1.2(4) and that the candidate is neurologically cleared for fire-fighting training and the performance of a fire fighter's essential job tasks

**Substantiation:** The committee has made these changes in order to provide some specificity and clarification to the requirements within this section.

**Committee Meeting Action:** Accept
(3) Documented evidence of a predisposition to recurrent heat stress rhabdomyolysis, metabolic acidosis or exertional-related incapacitation to include predisposition for malignant hyperthermia.

As an element of an EFOP project evaluating health effects of energy beverages (e.g. Red Bull, Monster, Rockstar, etc.), a review of the literature revealed a potential correlation between highly caffeinated beverages and malignant hyperthermia (MN). It is my belief that incorporation of a screening tool into routine pre-employment firefighter physical examinations for those susceptible to MH may reduce the potential for firefighters to experience this condition.

MH is a condition of hypermetabolism (runaway cellular metabolism) that can be life threatening and is typically associated with untoward medication reactions, to include caffeine. The symptoms of MH can closely mimic heat stroke, particularly in the pre-hospital setting, and is not uncommon in the wildland firefighting environment. Tucker and Dugas (2008) review 18 documented cases of heat stroke wherein, based upon the climatic conditions presented, in each case the victims experienced "a potential for heat loss that exceeded the amount of heat they would produce from exercise" (p. 3). Two of the cases involved healthy runners that experienced fully developed heat stroke like symptoms after 16 minutes of running in temperatures between 62-72°F. It is believed that previous episodes of MH may have been misdiagnosed as heat stroke. It is noted that certain individuals are predisposed to MH, which occurs through stimulating an increase in intracellular calcium, which in turn increases metabolism and core body temperature. Furthermore, agents that stimulate the sympathetic nervous system such as caffeine are known to have similar effects upon calcium channels. The authors conclude that heat stroke is perhaps a physiologic failure similar or related to MH rather than the result of environmental conditions per se.

Clearly many firefighting conditions mimic those encountered by endurance athletes as noted in the study by Tucker and Dugas (2008). As consumption of caffeinated beverages is on the rise, and caffeine has a mechanism of action similar to other medications that induce MH (Hopkins, 2000), there is perhaps an enhanced need to ensure we address this potential risk. The main candidates for testing for MH are those with a close relative who has suffered an episode of MN or has been shown to be susceptible. The standard procedure is the "caffeine-halothane contracture test", CHCT. A muscle biopsy is carried out at an approved research center, under local anesthesia. While clearly this test is neither appropriate nor cost-effective for routine pre-employment physical examinations, its inclusion into the NFPA 1582 standard should be considered so that evaluating physicians can at least be aware of this enhanced risk to firefighters and screen accordingly. At the very least future pre-employment physicals could include an inquiry into a family history of MH, which would then dictate further evaluation as deemed appropriate by the evaluating physician.

This is not original material; its reference/source is as follows:

Committee Meeting Action: Reject
Committee Statement: The committee has chosen to reject this based on the fact that there is a lack of evidence to link malignant hyperthermia to heat stress.
Revise text to read as follows:

Single unprovoked seizure and epileptic conditions including, simple, partial, complex, generalized, and psycho-motor 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. 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 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

Substantiation: The committee has made these changes in order to provide some specificity and clarification to the requirements within this section.

Committee Meeting Action: Accept
1582-5     Log #12     Final Action: Reject
(A.6.4.1(3))

Submitter: Jason Arthur Scott Arvizu, United States Forest Service - Los Padres National Forest
Comment on Proposal No:  1582-97
Recommendation: Delete text to read as follows:
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 firefighters as this exemption specifically excludes driving vehicles with passengers and does not apply to emergency response driving.

Substantiation: 1582-97 (Log #CP89) was created by the Technical Committee in response to Proposal 1582-13 (Log #5). It is not a valid resolution for several reasons. The major reason is the Technical Committee's misunderstanding of the restriction from carrying passengers. A restriction on a passenger endorsement does not mean the driver is unable to drive with other passengers. A passenger endorsement is specifically for:

“Any vehicle (bus, farm labor vehicle, general public paratransit vehicle, etc.) designed, used, or maintained to carry more than 10 passengers including the driver, for hire or profit, or is used by any nonprofit organization or group.”
(Exhibit “A” Commercial Drivers Handbook p. 1)

Therefore, the restriction limiting monocular firefighters from “transporting passengers” does not apply to firefighting or emergency vehicle operations. First, because there are few, if any, fire apparatus’ that have more than 10 passengers. Second, even if there were, fire agencies as a government entity do not meet any of the organization or group specifications.

The other issue is the lack of recognition for the supplemental driving performance evaluation (SPDE), which the Technical Committee refers to as a “special test”. This “special test” is a proven process used by the Department of Transportation (DOT), the state driving authorities under their jurisdiction, and even the Federal Aviation Administration. It is designed to give candidates the chance to prove they compensate for their condition. The proctors of the test also understand the requirements of driving associated with the fire service, including emergency vehicle operations. It also accounts for demonstrated ability to avoid the potential legal liability that comes with blanket exclusions that have proven to be discriminatory. The NFPA would be well served to apply the same proven policy for demonstrated ability. Failure to due so would leave the NFPA with an archaic policy not in line with their objective of being a progressive organization.

The Technical Committee is also assuming monocular firefighters have not and will not be able to receive an exemption. The DOT does, in fact, issue Class B Commercial Drivers Licenses (CDL) to monocular firefighters after passing the SPDE. If the NFPA makes the claim that CDL demonstrated ability exemptions do not apply to firefighters, it leaves them vulnerable to scrutiny. The medical and legal community has long supported demonstrated ability practices and the NFPA should be brought into alignment with those principles.

The current edition of NFPA 1582 Section A.9.12.3.1(2) even states that a firefighter’s ability to perform essential tasks, specifically with vision, should be determined by the evaluating physician. The exclusion the NFPA makes for monocular firefighters goes against that policy within the same paragraph. It makes a blanket exclusion based on a misunderstanding of DOT policy. Because the NFPA currently does not allow for objective evaluation for monocular firefighters, it’s standard has conflicting principles.

On one hand, the standard states that physicians are able to make the determination, based on their profession opinion and individual assessment, if a candidate is able to perform the essential functions. On the other, the NFPA does not allow for individual assessment because they claim the DOT does not allow for individual assessment. Then, when presented with proof that DOT does, and even encourages individual assessment, the NFPA still makes that claim that it does not apply to firefighters with #CP89. As show above, that claim is unfounded as well.

The only rebuttal from the NFPA to revision proposal 1582-13 (Log #5) is 1582-97 (Log #CP89). Since no other claims were raised in regards to the rest of the proposal, it can only be assumed that the Technical Standards Committee had no other valid arguments. If so, then this response to 1582-97 should prove the original proposal of 1582-13 is valid and subsequently be enacted for the next edition of NFPA 1582.

Committee Meeting Action: Reject
Committee Statement: The committee believes that this statement accurately reflects the committees opinion that a candidate with monocular vision should not be driving an emergency response vehicle.
According to the American Diabetes Association 2010 guidelines, lowering Hemoglobin A1C to below or around 7% has been shown to reduce microvascular and neuropathic complications of type 1 and type II diabetes. The recommendation for microvascular disease prevention in non pregnant adults in general is for a hemoglobin A1C level of less than 7%. Exceptions to this 7% level would be any condition that exists in addition to diabetes that is responsible for the Hemoglobin A1C is not accurately reflecting average glucose levels (e.g. hemoglobinopathies such as sickle cell disease). Additional exceptions to this 7% level would occur in individuals not already meeting NFPA 1582 requirements (ex history of severe hypoglycemia or end organ complications). See reference In Section D.

Recognizing that there is variability in the relationship between Hemoglobin A1C and 3 month average blood glucose, we recommend that hemoglobin A1C levels greater than the 8% threshold In Sections 6 and 9 be confirmed by a second determination before taking action. The physician evaluating an individual with a hemoglobin A1C > 8% should consider a discordance between the A1C and 3 month average glucose if:

- A repeated value is below the threshold
- A single A1C determination is discordant with prior or subsequent determinations with no other evidence of deterioration in glycemic control.
- 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)

If the evaluating physician suspects that the A1C overestimates average blood glucose, further evaluation may include:

- A repeat HbA1C
- Prior HbA1C values
- Serum Fructosamine determination
- Downloaded reports from a memory glucometer
- Downloaded reports from a 72 hour continuous glucose monitor
- 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: ASSAY PRECISION: The American College of Pathology accepts variation within 7% in A1C assays. Thus, a person with an A1C of 8% may have a value between 7.5 and 8.5% on repeat testing of the same sample. (Cohen 2010)

HEMOGLOBINOPATHIES: "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 under-treatment of diabetes." "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." ^1^

INTERINDIVIDUAL VARIATION:

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 8% was 147-217 mg/dl. (Nathan 2008)

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 upon the relationship between mean glucose and A1C, with increases in average RBC lifespan increasing net glycosylation and decreases (as in some hemoglobinopathies, or recovery from hemorrhage or anemia) decreasing net glycosylation. (Herman and Cohen 2010, Cohen 2008)

RBC GLUCOSE TRANSPORT: Variations in transport across the RBC membrane result in different intra and extracellular glucose levels, thus impacting on intracellular hemoglobin exposure to glucose and resultant glycosylation. (Khera 2008)

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 1/3 of inter-individual variation in A1C levels. (Hudson 1999, Snieder 2001, Hempe 2002, Cohen 2006, Soranzo 2010)

**INTER-ETHNIC VARIATION**: Numerous studies have identified the impact 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 impact of hemoglobinopathies noted above.


**Substantiation**: We submit the above language again, as agreed upon with the Technical Committee at their February 2011 ROP meeting, for clarification of the A1C requirement.

We request removal of the strikethrough language as this language contradicts the actual standard of A1C below 8% and the instructions regarding A1C evaluations in the Appendix language we are submitting.

**Committee Meeting Action**: Accept

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**A.9.18.2**

**Form for Medical Information Regarding Issues Related to Pregnancy in Fire Fighters.** The following information is intended to help you make informed decisions regarding your job activities if you are pregnant or considering pregnancy.

a. The majority of pregnant fire fighters will be able to continue to work throughout pregnancy, with some accommodations.

b. You should discuss with your treating physician any individual conditions that may require limitation of activities during pregnancy.

The following occupational hazards may 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 may be adversely affected by body changes of pregnancy.

Personal protective equipment is not designed to protect the fetus. The personal protective equipment fitted pre-pregnancy may not offer the same level of protection during pregnancy and may need to be re-fitted.

Post-delivery – Return-to-work decisions should be based upon an individualized evaluation of your current status, the requirements of your work assignment, and the type of delivery and its complications.

Lactation – Exposure to toxic substances as outlined above may result in these substances being present in breast milk.

**Substantiation**: This change was editorial in nature as there is no form for this section it was just additional information that is being provided.

**Committee Meeting Action**: Accept
1582-8 Log #11
(Annex C)

Final Action: Accept

Submitter: James E. Brinkley, International Association of Fire Fighters
Comment on Proposal No: N/A
Recommendation: Revise text to read as follows:

***Insert 1582_L11_ Include here***

Substantiation: Standard on Comprehensive Occupational Medical Program for Fire Departments Annex C contains copyrighted material from the Fire Service Joint Labor-Management Wellness-Fitness Initiative 2nd edition. The Fire Service Joint Labor-Management Wellness-Fitness Initiative was revised in 2008 and includes updates to the protocols listed with Annex C. The attached revisions will allow Annex C to accurately mirror the 3rd edition of the Fire Service Joint Labor-Management Wellness-Fitness Initiative. The IAFF hereby grants NFPA permission to use these materials.

Committee Meeting Action: Accept
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.
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 dynameter
      (b) Static bicep curl with dynameter
      (c) Static leg press with dynameter
      (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


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C.2.1 Fitness Evaluation Protocols for Members.

C.2.1.1 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 VO2 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 VO2 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 VO2 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 VO2. 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 VO2 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.2.1.1.1 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 (VO2max).

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 5.3 & Table 5.4

\[ BMI = \frac{\text{Weight (kg)}}{\text{Height (m)}^2} \]

US:

\[ BMI = 703 \times \frac{\text{Weight (lb)}}{\text{Height (in)}^2} \]

Table 5.3 & Table 5.4 Body Mass Index (BMI)

****Insert Table 5.3 and Table 5.4 Here****

(8) Determine 85 percent of the fire fighter's estimated maximum heart rate, which will be the target exercise heart rate, 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:

\[ \text{Target exercise heart rate} = [208 - (0.7 \times 40)] \times 0.85 = 153 \]
### 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

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<td>64&quot; (5'4&quot;)</td>
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### 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

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Table 5.5 Target Heart Rate (THR) for Respective Age
*THR is used as endpoint in submaximal aerobic capacity protocols

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<th>THR (BPM)</th>
<th>Age (yrs)</th>
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<td>147</td>
<td>61</td>
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THR Formula: \[208-(0.7 \times \text{age}) \times 0.85\]

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:

Target exercise heart rate = .85 (MHR – [age when MHR determined – current age])

(9) Record the target exercise heart rate on the protocol worksheet

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 millimeter 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 millimeter, 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 these 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) 7mm, (2) 4 mm, (3) 5 mm the average is calculated for measurement #2 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 (male - table 5.1; female – table 5.2).

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.

***Insert Figure 5.0 here***

Figure 5.0
Subscapular - located on the same diagonal line as the inferior border of the scapula, 2cm beyond the inferior angle.

Subscapular - located on the same diagonal line as the inferior border of the scapula, two cm beyond the inferior angle.

Pectoral – Located on a diagonal line, midway between the axillary fold and the right nipple.

Pectoral – Located on a diagonal line, midway between the axillary fold and the right nipple.

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.

Abdominal – located at the right of the umbilicus, on a vertical fold, 2cm from the right lateral border.

Abdominal – located at the right of the umbilicus, on a vertical fold, two cm from the right lateral border.
Figure 5.9
**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.

***Insert Figure 5.10 here***

Figure 5.10

***Insert Figure 5.11 here***

Figure 5.11

*****Insert Tables for Men/Women Skinfold Here*****

**C.2.1.1.1 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 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 heart rate during the cool-down. Record the recovery heart rate at 1 minute of cool-down.
Percentage of Body Fat estimate for MEN
Based on the Sum of Triceps, Subscapular, and Pectoral Skinfolds

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Percentage of Body Fat estimates for WOMEN

Based on the Sum of Triceps, Abdominal, and Suprailiac Skinfolds
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 below. Use the test time (TT) the participant completed the assessment (i.e. exceeded the THR) along with the treadmill conversion formula (VO2 max = 56.981 + (1.242 × TT) – (0.805 × BMI)) to estimate VO2 max. Record the VO2 max.

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C.2.1.1.2 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. Instruct 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 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:

- The participant’s heart rate exceeds THR for 15 seconds.
- The THR has not been met after 16 minutes.
- The participant asks to terminate the exercise.
- 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 5.6 Insert the test time (TT) at which the participant completed the assessment, along with the stepmill conversion formula to estimate VO2 max. Record the VO2 max.

*Note: TT is the time in minutes that the participant’s THR was exceeded and the test terminated.

**Stepmill Sub-maximal VO2 Prediction Formula**

\[
\text{VO2max} = 57.774 + (1.757 \times \text{TT}) - (0.904 \times \text{BMI})
\]

C.2.1.2 Hand grip strength evaluations shall use the following protocol. The hand grip dynamometer shall be a Jamar Hydraulic Hand dynamometer.

***Insert Figure C.2.1.2 here***
Figure C.2.1.1.2

(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 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.2.1.1.3 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. The fire department must verify that the dynamometer is equivalent to the Jackson Strength Evaluation System. A V-grip handlebar (chinning triangle) is required.

***Insert Figure C.2.1.1.3 here***

Figure C.2.1.1.3

(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 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.2.1.1.4** Arm strength evaluations shall use the following protocol. The arm 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. The fire department must verify that the dynamometer is equivalent to the Jackson Strength Evaluation System. A straight-grip handlebar is required.

***Insert Figure C.2.1.1.4 here***

**Figure C.2.1.1.4**

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 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.

**WFI VERTICAL JUMP — Optional Assessment**

**LEG POWER ASSESSMENT**

**Equipment:**
- Pressure Mat - “Just Jump” Probotics
- Safety Tape - or any object that can be suspended above the mat to act as a target
- Calculator

***Insert Figure C.2.1.1.4(9) here***

**Figure C.2.1.1.4(9)**

**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 (# lbs ÷ 2.2 = 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° angle and the hands by the sides (momentary pause @ 90°). 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. 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.

Convert the highest jump achieved in inches to centimeters (# inches × 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 × jump height (cm)) + (45.3×body weight (kg))] – 2055

Use the following conversions:
Height in inches to centimeters (# inches × 2.54 = cm)
Body weight in pounds to kilograms (# lbs ÷ 2.2 = kg)

C.2.1.1.5 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.

***Insert Figure C.2.1.1.5 here***

Figure C.2.1.1.5

(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 informed 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.

(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.

(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.

OPTIONAL ASSESSMENT:
WFI ALTERNATE GRIP PUSH-UP TEST
Equipment:
Push-up handles
Metronome
Stopwatch
Prop – 5”, plus the height of the handles

***Insert Figure C.2.1.5(7) here***

**Figure C.2.1.5(7)**

**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). 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)

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). 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.

**WFI PRONE STATIC PLANK — CORE STABILIZATION ASSESSMENT**

**Equipment:**
Stopwatch
Exercise Mat

***Insert Figure C.2.1.5(7)2 here***

**Figure C.2.1.5(7)2**

**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. 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.

C.2.1.1.7 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.

***Insert Figure C.2.1.1.7 here***

Figure C.2.1.1.7

(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.
(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. 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 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 1/4 in.) as the final score.

C.2.1.1.8 Fitness protocol equipment list:

- Jackson Strength Evaluation System
  Lafayette Instrument Company
  Phone: 800-428-7545 or 765-423-1505
  Website: www.licmef.com

- JAMAR Hydraulic Hand Dynamometer
  Lafayette Instrument Company
  Phone: 800-428-7545 or 765-423-1505
  Website: www.licmef.com

- Novel Acuflex II Trunk Flexibility Tester
  Novel Products, Inc.
  Phone: 800-323-5143
  E-mail: www.novelprod@aol.com

- StairMaster StepMill
  StairMaster
  Phone: 888-678-2476
  Website: www.stairmaster.com

- Probotics “Just Jump” Mat
Probotics, Inc.
Phone: 256-489-9153
Website: www.probotics.org

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(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.

(2) Jackson Strength Evaluation System with V-Grip Handlebar (chinning triangle): for information and local distributor 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 (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.

(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.

(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) 823-1895, ext. 7605, fax (425) 821-3794, Website www.stairmaster.com.
Technical Committee on Fire Service Occupational Safety and Health,

**Comment on Proposal No:** 1582-141

**Recommendation:** Replace Annex E from the ROP with the following:

***Insert Include 1582_LCC4_ANNEX E_Rec***

***Insert Include 1582_LCC4_ANNEX E References_Rec***

**Substantiation:** The changes that have been made were mostly editorial as well as updating footnotes and references.

**Committee Meeting Action:** Accept
Annex E

Pregnancy Issues

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

I. Introduction

a. Due to the legal issues associated with pregnancy and employment (see Section II), this chapter 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 to enable 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.

b. 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.

II. Legal framework

a. 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 AHJ should seek competent legal advice.

b. 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.

c. The US 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 fighter to decide, after consultation with their personal physician, whether they
accept a light duty assignment or other reasonable changes in their job assignments.

III. The pregnant fire fighter can be exposed to the following hazards associated with adverse outcomes to the pregnancy or damage to the fetus:

a. Physical hazards include heat, trauma, radiation and noise.

b. Chemical hazards include exposure to carbon monoxide, other products of combustion (e.g., hydrogen cyanide, acrolein, formaldehyde, benzene, acetaldehyde, formic acid), heavy metals and organic solvents

c. 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 complication is higher during pregnancy. Pregnant fire fighters should be aware of these risks, and follow good hygiene principles.

IV. Physical Hazards

a. 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].

b. Fetal mortality due to non-uterine trauma is increased during the first 23 weeks, possibly due to higher susceptibility to maternal hypotension during the first and second trimesters [4,5].

c. 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. Fetal mortality rates due to maternal trauma [3]:

   i. Overall with major trauma: 40 to 65% [4,5,6]

   ii. Overall with minor trauma: 1 to 5% [3,5]

   iii. In case of maternal pelvic fracture: 25 to 35% [5,7]

   iv. Gunshot wound to abdomen: 30 to 50 % [5]

e. Long-term outcomes after trauma: Besides fetal loss, trauma is also associated with 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].

f. 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), as improper placement may result in uterine rupture [3,5]. Seat belt use significantly reduced fetal mortality (five-fold reduction) in a series of cases of pregnant patients injured in motor vehicle accidents [9].

g. Standard personal protective equipment is not designed to protect the fetus. The personal protective equipment fitted pre-pregnancy may not offer the same level of protection during pregnancy.

h. Noise exposure during pregnancy has been associated, in human studies, with several adverse outcomes, including miscarriage [10,11,24,22], intrauterine growth retardation [11,12,13,22,23,24], preterm delivery [11,14,22,25], hearing loss in babies and children [15,16,26,27], and hypertension in pregnancy [11,22]. In a review of 10 studies on pregnancy and noise, most studies did not achieve statistical significance in showing negative effect of noise [17,28]. The safe threshold of noise exposure during pregnancy is unknown [18,20].

Intrauterine measurements showed that the fetus was not significantly protected against loud noises [19,29]. One study in human volunteers found a maximal intrauterine noise attenuation of 10 dB at 4000 Hz [20,30]. 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 [21,31]. The sound of a siren can reach up to 110 dB inside the cab of an emergency vehicle [22,23,34,35].

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” [18,20].
i. Shift work: Alternating shift work and night work have been associated with preterm birth [24,25,42,43], miscarriage [26,44] and lower birth weight [25,27,43,45]. Existing research is controversial.²

j. Heat: In animal studies, increase in maternal core temperature over 1.5°C has been shown to be teratogenic [30,48]. 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 [33,34,49,50]. Sports Medicine Australia recommends, “to avoid exercise in hot conditions” [33,49]. Exercising in a warm environment should be limited, and adequate hydration should be maintained with physical activity.

k. 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 [14,28,25,46].³

l. 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].⁴

V. Chemical Hazards

a. Carbon monoxide: Carbon monoxide exposure during pregnancy is associated with miscarriage, malformations, mental retardation and low birth weight [32,38,39].

b. Other toxic chemicals to the fetus 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].

c. Exposure to lead and other metals: Lead exposure during pregnancy is associated with serious materno-fetal complications, including miscarriage, premature

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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 [17,28]. 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 [28,46]. In a meta-analysis of 4 studies of pregnancy among nurses, shift work was significantly associated with a slightly increased risk of miscarriage [29,42].

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 [28,46].

⁴ Aviation-related (including helicopters) potential hazards for the fetus include vibration, noise, jet fuel and altitude [18,37,20,44].
rupture of membranes, pre-eclampsia, hypertension, and neurobehavioral effects in infants and children \[41,42,43\ 10,11,12\]. Even at low levels, lead exposure has been associated with preterm delivery; congenital abnormalities \[44\ 43\]; and decreased birth weight, length, and head circumference \[45\ 44\]. Current research suggests that there is no safe lead exposure threshold to children, infants and fetuses \[43,46,47\ 12,15,16\].

d. Exposure to organic solvents: Some organic solvents like xylene, might be harmful to the fetus \[18\ 20\]

e. 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 \[49\ 36\]. Extensive exposure to exhaust fumes might be dangerous because of exposure to carbon monoxide, benzene and other organic solvents from motor vehicles. In the US, 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 \[52\ 38\].

VI. Medical issues - The American College of Obstetricians and Gynecologists has published a list of medical contra-indications to exercise during pregnancy \[53\] [Exercise during pregnancy and the postpartum period. ACOG Committee. Opinion No. 267. \text{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.

VII. Risks by trimesters

<table>
<thead>
<tr>
<th>Trauma</th>
<th>First trimester</th>
<th>Second trimester</th>
<th>Third trimester</th>
<th>Lactation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>The risk of direct fetal trauma is increased due to</td>
<td>The risk of direct fetal trauma is increased due to</td>
<td>The risk of direct fetal trauma is increased due to</td>
<td>No additional risk</td>
</tr>
</tbody>
</table>

\footnote{Footnote: 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 \[42,43,48\ 11,12,17\].}
VIII. Recommended activity modifications during pregnancy

a. 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 [18,35,20,39]

5. Exposure to prolonged vehicular exhaust or high-volume vehicular traffic.

6. Aviation (including helicopter) unit assignment [18,35,36,37,20,39,40,41]

b. Recommendations by trimester:

i. First trimester

<table>
<thead>
<tr>
<th>Chemicals</th>
<th>Avoid exposure to heavy metals, hydrocarbons, carbon monoxide</th>
<th>Avoid exposure to heavy metals, hydrocarbons, carbon monoxide</th>
<th>Avoid exposure to heavy metals, hydrocarbons, carbon monoxide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other risks</td>
<td>Heat, noise, radiation, shift work, infections</td>
<td>Heat, noise, radiation, shift work, infections</td>
<td>Heat, noise, radiation, shift work, infections</td>
</tr>
</tbody>
</table>

mitigated due to the location of uterus, which is a pelvic organ in the first trimester

the intra-abdominal position after 13 weeks

the intra-abdominal position after 13 weeks
1. Modified, non-hazardous duty only if requested by the fire fighter in consultation with her personal (treating) physician.

2. The fire physician should ensure that the fire fighter and her treating physician are aware of risks created by the job assignment.

3. All recommendations stated in VIII.a above

ii. Second trimester

1. An accommodation for maternity uniform may be needed.

2. The following are not recommended:
   a. Assignments with alternating shift work
   b. Heavy lifting and prolonged standing

3. All recommendations stated in VIII.a above

iii. Third trimester

1. The fire fighter may have to be taken off hazardous duties, when she is unable to perform the required job functions, due to issues with balance, speed and agility. She should be given a modified duty assignment.

2. An accommodation for maternity uniform may be needed.

3. The following are not recommended:
   a. Assignments with alternating shift work
   b. Heavy lifting and prolonged standing

4. All recommendations stated in VIII.a above

IX. Post-delivery: Return to work

a. 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.6

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6 Sports Medicine Australia recommends waiting for up to 6 weeks after delivery before performing intense physical exercises [54].
b. 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.

c. The physician should consider various issues such as [55]:

- Delivery trauma and mode of delivery
- C-section healing
- Physical deconditioning, fatigue and lack of sleep
- Musculoskeletal conditions (e.g. back pain, carpal tunnel syndrome, tendonitis)
- Pregnancy-related issues
  - Hypertension
  - Eclampsia
  - Gestational Diabetes
- Post-partum depression
- Post-partum thyroiditis
- Deep venous thrombosis
- Anemia
- Other complications

X. Post-delivery: Lactation

a. Fire fighters who are breastfeeding should avoid unprotected exposure to toxic levels of heavy metals and other chemicals.

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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].
Sports Medicine Australia recommends waiting for up to 6 weeks after delivery before performing intense physical exercises [54].

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].
Pregnancy references

1. Pregnancy Discrimination Act, 42 USC §2000e(k)


Submittal: Katie Hathaway, American Diabetes Association
Comment on Proposal No: 1582-137

Recommendation: Add new text as follows:
Form to be included in the Appendix of 1582 on Diabetes.

*****Insert Include for 1582_L10_Philician Evaluation Form_ Rec Here****

Substantiation: ROP 1582-137 (Log #10) states as the reason for rejection of our proposal, "Lack of a form at time of meeting in hopes that the submitter will submit the form at the ROC stage." We are resubmitting this form at this time.
Committee Meeting Action: Accept in Principle
Add Annex X to read as follows:

***Insert Include Annex X Physician Evaluation Form for Fire Fighters with Diabetes Mellitus***

Committee Statement: The committee has accepted the submitted form however they have made some minor changes in the location of some text. Also there are some numbering issues that need to be adjusted. The committee has rearranged the text and check boxes at the end of the form that refer to the physicians statement. The committee believes that the order they have decided to place them is more appropriate than the order in which they were on the submitters form.
Annex X  Physician Evaluation Form for Fire Fighters with Diabetes Mellitus

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

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 NFPA Technical Committee on Occupational Safety and Health in consultation with representatives of the American Diabetes Association. The relevant sections of these guidances are listed below in bold, followed by the information needed to assess whether the individual meets these guidances.

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.
II. Assessment

1. 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):

____________________________________________________________________________________

This person has: ☐ type 1 diabetes ☐ type 2 diabetes

Date of diagnosis: ____ / ____ / _____

Attached records for prior 3 years or since onset of diabetes whichever is shorter for:
☐ out-patient treatment ☐ in-patient treatment

2. 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.\(^1,2\)

Current insulin regimen:

Insulin pump brand & 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: ____ / ____ / ____
3. If type 2 diabetes on insulin, has been on a stable medication regimen for the three (3) months prior to evaluation. If on oral agents alone, should be on a stable medication regimen for one month prior to evaluation.

Current medication regimen:

<table>
<thead>
<tr>
<th>Oral agents</th>
<th>Insulin</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

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.

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.

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 has completed the following education in the use of a continuous insulin infusion pump (indicate year of completion):

__________________________________________________________

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.
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. 

<table>
<thead>
<tr>
<th>Date</th>
<th>HbA1C</th>
</tr>
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<tbody>
<tr>
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</tbody>
</table>

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)

____________________________________________________________________________________

____________________________________________________________________________________

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:

a. severe hypoglycemia (loss of consciousness, seizures or coma, requiring the assistance of others or needing urgent treatment [glucagon injection or IV glucose]) or

b. a blood sugar < 60 mg/dl with unawareness 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 of episodes:

____________________________________________________________________________________

____________________________________________________________________________________

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.

Copy of ophthalmology or optometry report is attached:

☐ Yes  ☐ No – please explain
12. Has normal vibratory testing with 128 Hz tuning fork, has normal testing with 10 gram Semmes-Weinstein monofilament\(^{11}\) and normal orthostatic blood pressure and pulse testing.\(^{12}\)

**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\(^{13}\) 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, kidneys, 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 ≤ 30:1, and measured or calculated creatinine clearance > 60 ml/min.\(^{14}\)

**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 a 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

__________________________________________________________  ____________________________
Printed or Typed Name of Physician                          Phone Number
References

1. 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.

2. 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.

3. 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.

4. 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 the addition of a thiazolidinedione to insulin or a sulfonylurea
   - three months for the addition of insulin.

5. Testing schedules are individual. What follows is a common pattern. Individual patterns may differ.

<table>
<thead>
<tr>
<th>Therapeutic Regimen</th>
<th>Glucose Testing Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet alone</td>
<td>Once or twice a week</td>
</tr>
<tr>
<td>Metformin, Thiazolidinediones, or Alpha Glucosidase inhibitors alone or in combination</td>
<td>Once or twice a week</td>
</tr>
<tr>
<td>Sulfonylureas, meglitaniides, nateglinide – alone or in combination with the above group</td>
<td>Twice a day – AM and at supper; with any suspected hypoglycemic episodes</td>
</tr>
<tr>
<td>Insulin – one shot in combination with orals</td>
<td>Twice a day AM and at supper, with any suspected hypoglycemic episodes. 2-3 AM once a week</td>
</tr>
<tr>
<td>Insulin – two or more shots, Insulin pump</td>
<td>3 to 4 times a day – at meals and bedtime. 2-3 AM once a week; with any suspected hypoglycemic episodes</td>
</tr>
</tbody>
</table>

6. See [http://care.diabetesjournals.org/cgi/content/full/28/suppl_1/s72](http://care.diabetesjournals.org/cgi/content/full/28/suppl_1/s72)

7. See [http://care.diabetesjournals.org/cgi/content/full/27/suppl_1/s91](http://care.diabetesjournals.org/cgi/content/full/27/suppl_1/s91)

8. If Hemoglobin A1C > 8% this may signal a problem with diabetes management that warrants further assessment.

9. See [http://care.diabetesjournals.org/cgi/content/full/28/suppl_1/s61](http://care.diabetesjournals.org/cgi/content/full/28/suppl_1/s61)

10. No more than one dot, blot, or flame-shaped hemorrhages or microaneurysm in all four fundus quadrants. [http://www.jceh.co.uk/journal/46_04.asp](http://www.jceh.co.uk/journal/46_04.asp)

11. See [www.med.umich.edu/mdrtc/textonly/educmats/MNSI_howto.doc](http://www.med.umich.edu/mdrtc/textonly/educmats/MNSI_howto.doc)

12. 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.aafp.org/afp/20031215/2393.html](http://www.aafp.org/afp/20031215/2393.html)


14. 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://care.diabetesjournals.org/cgi/content/full/27/suppl_1/s79)