NFPA 1580 CARDIORESPIRATORY FITNESS

A HEALTH STANDARD IN SUPPORT OF FIRE FIGHTER WELLNESS AND READINESS

Cardiorespiratory fitness (CRF) is widely recognized as a powerful indicator of long-term health. Individuals with higher CRF are at a significantly lower risk of cardiovascular disease, metabolic disorders, and early death.[1,2,3] Organizations such as the American Heart Association and the American College of Sports Medicine have recommended that CRF be treated as a clinical vital sign because, when measured and interpreted appropriately, it can provide meaningful and actionable insight into overall health.[3,4]

For fire fighters, CRF is critically important. Sudden cardiac events continue to be the leading cause of on-duty deaths,[5] and lower CRF is associated with less favorable metabolic profiles and an increase in cardiovascular risk factors,[6,7] conditions that are common in the fire service. These risks highlight the importance of assessing CRF in ways that are valid, equitable, and supportive of prevention.

In 2024, NFPA revised the 1582 (now 1580) standard with the introduction of age- and biological sex-adjusted CRF percentiles that better reflect current clinical practice, and to provide a more appropriate means of identifying fire fighters at an elevated risk of specific health conditions. This change replaced the absolute threshold of 12 metabolic equivalents (METs), which had historically been uniformly applied to all fire fighters.

Although this update was made in support of fire fighter health and fairness and to better reflect age-related changes in CRF and physiological differences in biological sex-related CRF, it has prompted concern among some stakeholders regarding operational readiness and the notion of "one job, one standard".[8] While the desire for clear CRF-related expectations is understandable, current scientific evidence does not support the use of CRF, or any single fitness measure, as a direct assessment of a fire fighter's ability to perform essential job tasks. It is important to note that **NFPA 1580 is a medical health standard, not a fit-for-duty standard.**

NFPA 1580 AS A MEDICAL HEALTH STANDARD

NFPA 1580 interprets CRF using age- and biological sex-adjusted percentiles, which is consistent with long-standing established clinical practices for pulmonary function, metabolic markers, and other physiological measures.[9,10,11] Because CRF varies predictably with age and biological sex, percentile-based interpretations can be used to distinguish normal variation from true health-related reductions in fitness. This is important when evaluating fire fighters across a wide range of ages and training backgrounds.

Under the previous standard, CRF thresholds of 12, 10, and 8 METs were used to guide clinical decisions. However, comparisons with general population norms show that many younger fire fighters could have very poor age-adjusted CRF levels while remaining above the historical action thresholds. For example, among 20–29-year-old males, 12, 10, and 8 METs correspond approximately to the 30th, 10th, and 1st percentiles, respectively - levels associated with long-term health risks.[12] As a result, many young fire fighters with clinically low CRF may have been missed and therefore did not receive follow-up or early support.

The updated standard addresses this gap by identifying clinically meaningful reductions in CRF much earlier, especially among younger fire fighters.

The updated standard uses 50th and 35th percentiles as clinical thresholds that trigger follow-up, aligning with evidence from large epidemiological cohorts showing that lower age- and biological sex-adjusted CRF is associated with substantially higher rates of cardiovascular disease, metabolic disorders, and early death.[1,2,3] The NFPA CRF standard does not aim to evaluate operational readiness but is meant to identify fire fighters whose CRF places them at increased short- and long-term health risk so that early preventive measures and clinical follow-up can be offered.

This is particularly important for younger fire fighters, whose CRF is often most comparable to age-matched individuals from the general population. Data from a large U.S. fire fighter cohort showed that **male fire fighters aged 20–29 had median CRF values below age-matched reference standards from the general population,**[13] whereas fire fighters over age 30 exhibited values that were, on average, 8–12% above their age-matched reference values.[13] This finding suggests that younger fire fighters may be no more fit, and in some cases, less fit, than other adults their age, while older fire fighters are relatively fitter than their age-matched peers. This means that **identifying low CRF early in a fire fighter's career is critical for long-term health.**

Many healthy and capable fire fighters, particularly those over the age of 45, have CRF values below the historical 12 MET threshold due to normal age-related decline.[12] CRF typically decreases by 7–10% per decade after age 30, even among physically active adults.[12] Treating these individuals as medically "unfit" or "at risk" misrepresents their health status and fails to account for normal age-related physiological changes.

Conversely, some younger fire fighters may exceed 12 METs yet fall within lower age-adjusted percentiles, which reflects an elevated long-term health risk.[3]

Using a relative standard that is based on age and biological sex improves fairness and precision, enabling preventive support for every fire fighter who may benefit from early intervention.

WHY AN ABSOLUTE CRF STANDARD IS PROBLEMATIC

The long-standing 12 MET standard has a limited physiological basis. Average CRF values for adults in their 50s and 60s fall well below 12 METs, even among physically active individuals.[12] Expecting all fire fighters to achieve or maintain this level of CRF across their careers is inconsistent with human physiology and would misclassify many healthy, experienced fire fighters who remain fully capable of performing operational tasks. Fire fighter-specific research supports this. Department-level data and multi-department samples show that a substantial proportion of active fire fighters fall below 12 METs while maintaining full operational status.[8,14] These patterns reflect normal aging, not diminished operational capability. Concerns about operational readiness often cite physiological studies that demonstrate high peak VO_2 values during simulated firefighting.[15,16] However, these findings are often misinterpreted as minimum job

requirements. It is important to recognize that these studies reflect internal workload experienced by participants, not the external demands of the job tasks.

Firefighting tasks have fixed external requirements, but individuals exhibit substantial variability in the internal physiological strain required to complete them due to differences in factors such as technique, pacing, strength, movement efficiency, heat tolerance, and operational experience. This variation has been documented across studies of simulated firefighting tasks.[17,18]

Because VO_2 responses reflect "how hard someone worked", and not "what the job requires", these values cannot be interpreted as minimum fit-for-duty standards.

WHY NFPA 1580 IS NOT A FIT-FOR-DUTY STANDARD

Fire service operational performance depends on factors such as strength, muscular endurance, movement efficiency, decision-making, technical skill, heat tolerance, teamwork, and experience, among others, not just CRF alone.

While CRF contributes to the overall potential for work capacity and recovery, it is not the sole determinant of job performance.

Fire fighters often regulate their effort to match their physical abilities (i.e., pacing and prioritizing). This is widely documented in occupational and athletic environments and enables individuals to perform demanding tasks safely (and often effectively and efficiently) by adjusting their effort level.

A fire fighter with moderate CRF may perform a complex task safely by capitalizing on their job-related experience, as well as by using efficient movement strategies, controlled pacing, and appropriate technique. Conversely, a fire fighter with higher CRF may work inefficiently, incurring greater internal strain despite having a higher fitness level. This variability reinforces the fact that CRF does not independently determine job capability.

Scientific reviews show that, on average, task performance improves with higher CRF, but no study has identified a CRF threshold below which fire fighters are unable to perform essential tasks.[19,20] Performance improvements follow a gradient, with substantial overlap between individuals of moderate and high fitness.

Movement skill and biomechanical efficiency also influence the internal demands associated with job tasks. Research demonstrates that variations in trunk control, lifting mechanics, and lower-limb strategies affect joint loading and physical stress during common firefighting movements.[21,22]

Although these studies do not assess metabolic demand directly, they show how movement quality modifies mechanical strain, which has implications for fatigue, injury risk, and overall task efficiency.

Table. How the absolute requirement of 12 METs misclassifies fire fighters across age groups

AGE	12 METs	CLINICAL IMPLICATIONS	RISK ASSESSMENT
20–29 YRS	~30th percentile	**Low Relative Fitness/Health** CRF is clinically low for this age group, yet fire fighter would "pass" the 12 MET standard without follow-up.	Fails to identify health risk
40–49 YRS	~65th percentile	**Good Relative Fitness/Health** CRF is above average for this age group, and the fire fighter would have met health expectations.	Correctly identifies good health
60–69 YRS	~95th percentile	**Excellent Relative Fitness/Health.** CRF is very high and rare for this age group. Most fire fighters would fall far below 12 METs despite being capable.	Misclassifies healthy, capable fire fighters

Fitness tests, such as the CRF, measure physiological potential. They do not measure how that potential is expressed during real-world tasks. **Because a fire fighter's job performance depends on "how" tasks are performed, not simply "how fit" someone is, CRF alone cannot determine operational readiness.** Legally defensible occupational standards must be based on validated job tasks[23] (and are also typically subject to collective bargaining between labor and management). At present, CRF does not meet this criterion.

A CLEARER PERSPECTIVE ON THE 'ONE JOB, ONE STANDARD' ARGUMENT

The fire service has long valued the principle that all fire fighters should be capable of performing essential job tasks safely and effectively. However, for this principle to be applied correctly, the "standard" must reflect the tasks themselves, not individual physiological metrics.

Hose advancement, ladder raises, victim drags, equipment carries, and forcible entry all impose external demands that do not vary by age or biological sex.
These external demands define the job.

CRF, however, reflects the internal response to those demands, which varies significantly between individuals because of differences in strength, movement skill, heat tolerance, familiarity with the task, hydration, fatigue, experience, etc. A single CRF threshold, which reflects this internal response, cannot serve as a uniform operational standard for the fire service.

A true "one job, one standard" approach applies to validated occupational task performance, not medical or health screening. NFPA 1580 ensures fairness in establishing health-related risks by accounting for normal physiological variation, but it does not offer a readiness standard. Fit-for-duty standards, when developed, must be based on validated occupational tasks that all fire fighters can be expected to perform. **Treating a clinical metric like CRF as if it were a task requirement conflates two different concepts and risks inappropriate or discriminatory decisions by fire department administrators.**

THE ROLE AND STRENGTH OF NFPA 1580

NFPA 1580 strengthens the fire service by improving the identification of fire fighters who may be at an elevated risk of long-term health conditions. For younger fire fighters, low CRF is strongly predictive of future cardiovascular risk, making early detection especially important.[1] For experienced fire fighters, percentile-based interpretations prevent unnecessary restrictions by distinguishing normal, age-related declines from clinically meaningful reductions.

NFPA 1580 is a medical health-focused standard, where CRF is one of the most informative and evidence-supported metrics.

It identifies fire fighters of any age and biological sex who are at increased short- and long-term health risk and may benefit from clinical follow-up, prevention programs, and supportive interventions, **using the same percentile-based criteria**. Acknowledging this distinction helps to ensure that age- and biological sex-related differences in CRF are interpreted appropriately within a medical health-focused framework.

CONCLUSION

Fire fighters deserve standards that are fair, scientifically valid, and aligned with both medical understanding and operational reality. **NFPA 1580 meets these expectations by focusing on medical health risk.** It identifies fire fighters who may benefit from intervention, supports early prevention, and avoids misclassifying capable fire fighters based on unrealistic physiological thresholds that may be inconsistent with their age and/or biological sex.

The desire for clear operational readiness expectations in fire service is legitimate. However, current evidence does not support using CRF as a fit-for-duty standard. Operational standards should be based on validated occupational tasks, not fitness measures. NFPA 1580 provides a medically appropriate framework for CRF assessment while preserving the distinction between health screening and job performance.

The IAFF supports the current language in NFPA 1580 because it enhances fairness, strengthens early prevention efforts, respects normal physiological variation, and aligns with the best available scientific evidence.

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