NSCA NATIONAL STRENGTH AND CONDITIONING ASSOCIATION

Physical Fitness as a Professional Standard in the Fire Service

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Executive Summary

Firefighting places substantial physiological demands on personnel, often requiring rapid transition from rest to strenuous work and wearing protective equipment. These conditions increase physiological strain and fatigue, making physical fitness an essential part of firefighter health and safety. Research consistently links greater aerobic capacity with faster completion of fireground tasks and the ability to perform sustained work at a lower relative level of effort. Muscular strength, power, and muscular endurance are also important for occupational tasks. Departments of varying sizes and resource levels can support firefighter physical fitness, but effective implementation requires consideration of local needs and operational constraints. Support may include qualified internal personnel, peer-fitness networks, contracted professionals, university or health-system partnerships, and

hybrid models. Real-world fire service programs demonstrate that effective implementation of fitness programs can take several forms. However, long-term sustainability depends on leadership and policy to reinforce physical fitness as a professional expectation while clearly defining both firefighter and department responsibilities.

Research Linking Physical Fitness to Firefighter Health and Occupational Performance

Firefighting requires sudden, strenuous work while wearing heavy protective equipment and self-contained breathing apparatus, increasing physiological strain and accelerating fatigue. Declining physical capacity during emergency operations can compromise both individual and crew performance. Aerobic capacity, muscular strength and endurance, power, and agility represent important components of firefighter health and performance (5,17).

Aerobic capacity is strongly related to firefighter job-task performance. A review of 32 studies found that greater aerobic capacity was associated with faster job-task performance, with the strongest association with aerobic capacity (12). Greater aerobic capacity also provides a larger physiological reserve, reducing the relative effort required for a given task and supporting sustained work and recovery during prolonged incidents (3,12).

Strength and power are also important for firefighter job-task performance. Advancing a charged hose line requires firefighters to control a heavy and unstable load. Forcible entry requires the ability to produce force rapidly. Removing a victim may require near-maximal effort under difficult conditions. A review of the available research found that firefighters with greater strength, power, and high-intensity work capacity performed job-related tasks more quickly. Lower-body strength was particularly important during tests that combined several common fireground duties (11).

Physical fitness supports cardiovascular health and reduces overall injury risk. Sudden cardiac events are a major cause of duty-related firefighter deaths, and emergency responses place intense stress on the heart. Fire suppression can drive heart rate close to maximum while heat and protective clothing increase the workload placed on the cardiovascular system (18). Firefighters with greater aerobic capacity tend to have healthier blood pressure, cholesterol, and glucose levels (4). These factors influence both long-term cardiovascular health and the ability to handle the sudden physical strain of emergency operations (16). Lower aerobic and overall physical fitness has also been associated with greater injury risk among firefighters (14,15).

A Scalable Fitness Model for Department Adoption

Fire service implementation research indicates that leadership support, dedicated time, professional guidance, and programs that account for local operational demands are important determinants of participation and sustainability of fitness programs (1,9). The table below describes three levels of program capacity: foundational, developing, and comprehensive.

Component	Foundational	Developing	Comprehensive
Leadership & ownership	Designated coordinator or fitness champion; visible leadership support	Defined program responsibilities; supported peer-fitness network	Formal program leadership integrated into department operations and planning
Training access	Flexible opportunities for exercise	Consistent and personalized training opportunities across stations/shifts	Protected on-duty training opportunities integrated into normal operations
Programming	Basic evidence-informed programs or templates with scalable exercise options	Standardized, progressive programming with options for different abilities and schedules	Individualized and group programming informed by job demands and individual needs
Professional support	Qualified internal resources (e.g., TSAC-F-certified personnel) or community partnership.	TSAC-F-certified personnel with contracted or regional support from a qualified strength and conditioning professional	Embedded or regularly contracted qualified strength and conditioning professional with multidisciplinary support

Component	Foundational	Developing	Comprehensive
Equipment & facilities	Basic, versatile, shared, or community-based resources	Planned equipment purchases and consistent station access	Dedicated facilities / equipment aligned with department needs
Assessment & evaluation	Small number of feasible physical fitness and participation measures	Periodic standardized physical fitness assessment and basic program tracking	Integrated physical fitness, job-task performance, health, injury, with ongoing evaluation

Professional support can scale as programming and equipment do. Research in firefighters supports considering flexible delivery strategies when time, geography, or staffing limit traditional supervised exercise (9,13). Long-term sustainability also depends on embedding the program into normal department operations and culture instead of relying on a temporary initiative or single champion (10).

Qualified Strength and Conditioning Professionals

Effective fire service physical fitness programs should be designed, overseen, or supported by professionals with appropriate education, certification, experience, and understanding of firefighter occupational demands. The NSCA Tactical Strength and Conditioning Facilitator (TSAC-F) certification provides an occupation-specific credential for professionals working with tactical populations, including firefighters. These competencies closely align with the responsibilities required to support the physical fitness programs described in this white paper. The Certified Strength and Conditioning Specialist (CSCS) should also be recognized as an important professional qualification. The CSCS provides broader preparation in strength and conditioning science, assessment, program design, exercise technique, and performance development and is particularly appropriate for professionals responsible for program design, individualized training, or department-level strength and conditioning leadership. Holding both credentials may provide complementary preparation by combining broad strength and conditioning expertise with tactical-specific knowledge.

Real-World Examples and Models for Firefighter Fitness Programs

Fire departments have implemented physical fitness and wellness initiatives using different delivery models, with reported outcomes ranging from sustained health behavior change and injury reduction to lower organizational costs and earlier identification of health concerns. The examples below illustrate peer-led programming, targeted recruit fitness, and integrated wellness-fitness evaluation approaches.

Example	Program model	Reported outcomes
PHLAME – Oregon Fire Service	Evaluated across four large urban fire departments and 1,369 firefighters. The program used 12 peer-led sessions delivered within existing fire crews, addressing exercise and other health behaviors while leveraging the team structure and culture already present in the fire service. Follow-up work identified crew support, friendly competition, and feedback from annual health assessments as factors supporting long-term participation.	Participating departments reported fewer compensation claims and lower medical costs than departments that did not participate. The peer-led model produced an estimated $4.61 in benefit for every dollar invested (8), and positive behavioral changes were reported five years later (10).
Tucson Fire Department – Probationary Firefighter Fitness (PFF-Fit)	Developed after the department reviewed recruit injury patterns and identified sprains, strains, and acute overexertion as important concerns. A structured fitness program was designed around the physical demands of academy training and the probationary year.	The participating recruit class experienced fewer injuries and compensation claims than three previous academy classes. ~ $33,000 in injury- and claim-related costs were avoided during the first year (6).
Dallas Fire-Rescue Department	Implemented an annual wellness-fitness evaluation combining medical screening and physical fitness assessment with individualized follow-up. Firefighters with concerning findings were referred for medical evaluation and provided individualized recommendations for follow-up care.	Early evaluations identified previously undiagnosed cardiovascular disease, cardiovascular risk factors, and cancers requiring medical attention. The model demonstrates how routine evaluation can connect screening and assessment with referral and follow-up (22).

Leadership Engagement and Policy

Physical fitness is more likely to become a professional expectation when leadership support is visible in communication and daily practice. Fire-service research indicates that dedicated time, engagement, and leadership support influence participation, while company officers and respected peers help translate organizational priorities into normal station behavior (9). Cultural integration is strengthened when fitness is reinforced through accountability, and trust, including clear communication (2,10). The table below summarizes practical actions departments can take to reinforce physical fitness as a professional expectation through leadership behavior and everyday culture.

Action	Leadership and cultural application
Define it	Clearly communicate that physical fitness supports operational readiness and is expected.
Enable it	Provide training opportunities, resources, equipment, and access to qualified guidance.
Model it	Chiefs, company officers, and peers visibly reinforce that physical fitness is valued.
Normalize it	Integrate fitness into routine station life, crew practices, and daily expectations
Support it	Use program and assessment information to guide improvement, referral, and development

Policy converts support for physical fitness into clear and consistent organizational expectations. Effective policy should define both what is expected of firefighters and what support the department will provide in return, including reasonable access to training and pathways for improvement. Policies should support readiness and workforce development (23).

Measuring Program Effectiveness and Return on Investment

A firefighter physical fitness program should be evaluated by whether it is being delivered as intended, improving relevant firefighter outcomes, and creating organizational value (7). Department leaders need to know whether the program is reaching firefighters, improving operational readiness, and reducing organizational costs. Program effectiveness should be measured across three areas.

Area	Core measures	Review schedule
Program delivery	Participation rate and equipment utilization	Quarterly
Operational readiness	Changes in fitness, job-task performance, and injury rates	Bi-Annually
Organizational impact	Workers' compensation costs and lost-duty time	Annually

Participation is an important early indicator, so Departments should consider access across shifts and stations. Outcomes should also match the program's objectives. Physical fitness and job-task performance measures can be collected consistently and clearly linked to health and/or job performance outcomes. Injury outcomes should include both frequency and severity. These measures distinguish a minor injury from one that removes a firefighter from service for several months. Financial evaluation should include the actual costs of delivering the program, such as professional staffing, and any equipment. Financial benefits may include changes in workers' compensation, injury-related overtime for backfill, medical costs, and other workforce disruptions. When both program costs and monetized benefits can be estimated, departments could report either a benefit-to-cost ratio or ROI:

$$\textbf{Benefit-to-cost ratio} = \textbf{monetized benefits} \div \textbf{program costs}$$

$$\textbf{ROI} = [(\textbf{monetized benefits} - \textbf{program costs}) \div \textbf{program costs}] \times 100$$

Fire service examples show how these approaches can be applied. The PHLAME study reported a 4.61:1 return on investment (8), while the Tucson recruit fitness intervention reported ~ $33,000 in avoided injury and claims costs during its first year (6). Participation and selected readiness measures can be evaluated relatively early, whereas injury and financial outcomes generally require longer observation because serious injuries are less frequent and annual costs can fluctuate.

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