Work Capacity Testing

Some jobs, like firefighting, require passing a job-related work capacity test to meet minimum qualifications. Such tests help ensure that prospective workers have the capacity to perform work without undue fatigue and without becoming a hazard to themselves or coworkers.

Beginning in 1975, a 5-minute step test determined firefighter fitness. Field review indicated that the step test was not sufficiently job-related, did not reflect muscle fitness requirements, had potential for errors, and violated the Americans With Disabilities Act. A systematic process led to the development of new tests for arduous, moderate, and light duties.

The Pack Test

The Pack Test is a 4.83-km (3-mile) hike over level terrain carrying a 20.5-kg (45-pound) pack. To qualify for arduous fireline work, you must complete the pack test in 45 minutes or less. Tests taken at altitude should be adjusted (see table). Jogging during the test is not permitted. A score of 45 minutes correlates with a step test score of 45 or a 1.5-mile-run time of 11 minutes 40 seconds, the previous standard for wildland firefighters.

Altitude Correction

Altitude (feet)	3-mile Pack Test (Seconds)
4000	30
5000	45
6000	60
7000	75
8000	90

Add the correction to the required test time.

The energy cost of the Pack Test is similar to fireline work. Pack Test performance relates directly to muscular fitness. Because of the test distance, the Pack Test is an excellent indicator of the capacity to perform prolonged arduous work under adverse conditions, with a reserve to meet unforeseen emergencies.

Additional field tests were developed to qualify individuals for moderate and light duties.

Fitness Requirement	Test	Description
Arduous (45 mL/kg • min) Lift over 50 lbs	Pack Test	3-mile hike with 45-pound pack in 45 min
Moderate (40 mL/kg • min) Lift 25-50 lbs	Field Test	2-mile hike with 25-pound pack in 30 min
Light (35 mL/kg • min) Light lifting	Walk Test	1-mile hike in 16 min

Training for the Pack Test

Start training at least 4 to 6 weeks before you are scheduled to take the test. For work hardening, you may want to train in the boots you will wear on the job. Ankle-height hiking or sport shoes must be worn during the test for ankle protection.

Begin by hiking a 3-mile flat course without a pack. When you can cover the course in less than 45 minutes, add a pack with about 25 pounds. Increase the weight until you can hike 3 miles in 45 minutes while carrying 45 pounds.

Also, hike hills with a pack to build leg strength and endurance. Jog the flat course without a pack to build aerobic fitness. Do overdistance for stamina, and cross-train with mountain biking and weights to build endurance and strength.

Work Hardening

Aerobic and muscular fitness training are two key elements in your preseason preparation. Work hardening is the third.

Work hardening is a gradual progression of work-specific activities designed to bring you to the job ready to deliver a good day's work. While fitness training provides the foundation for work capacity, it is no substitute for job-specific work hardening. Work hardening ensures that the body structures used on the job are tough and ready to go. Feet are work-hardened when you hike and work in the boots you'll use in the field. Hike up and down hills and sidehills at the pace you'll use on the job. Do some extended hikes with a loaded pack to prepare for carrying loads.

If you will be a firefighter, you should do some work with a tool like the Pulaski. There is no substitute exercise to prepare the back and upper body for prolonged work in the position demanded by such hand tools. This work will also toughen your hands so you won't get blisters the first day on the job. Come to the job hardened and ready to go.

The Bottom Line

Aerobic and muscular fitness training, work-hardening, and Pack Test training prepare you to meet the demands of any rigorous assignment from the very first day on the job. You will be able to work safely and more productively thanks to your preparation and hard work.

For more information see: Sharkey, Brian, *Fitness and Work Capacity* (NFES 1596), 1997.

Fit to Work

Firefighting and other forms of field work demand a high level of fitness to safely perform arduous day-long work in difficult environmental conditions, including steep terrain, extreme temperatures, altitude, and smoke, and to meet unforeseen emergencies. When prolonged hard work is involved, fitness is the most important factor in work capacity.

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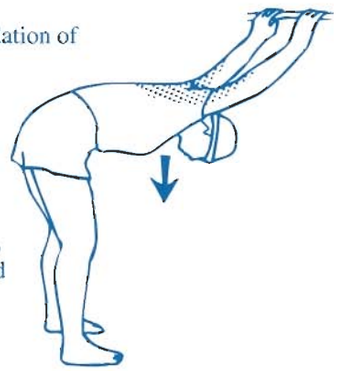
Work capacity is a composite of fitness, acclimatization, nutrition, skill, experience, motivation, and intelligence. Fitness is the most important factor. Fitness has two components, aerobic and muscular.

Aerobic fitness is a measure of your ability to supply working muscles with the oxygen they need to perform vigorous day-long work. When you can deliver and use oxygen efficiently, you can do more work without undue fatigue.

Muscular fitness includes strength, muscular endurance, and flexibility. Strong workers can lift and carry heavy loads with less fatigue or risk of injury. Muscular endurance enables you to continue working at otherwise fatiguing tasks. And flexibility means a better range of motion that lowers the risk of injury.

Fitness is the foundation of work capacity. That's why resource agencies stress its importance, and why you should report to the job fit, work-hardened, and ready to take on tough field assignments.



Gaining fitness is a gradual process that can take 2 to 3 months for substantial improvements. Working yourself into shape on the job is not an option. Some jobs, like firefighting, require that you pass a job-related work capacity test to ensure the capacity to perform arduous work. In field work, particularly firefighting, fitness is a matter of safety both for you and your crewmembers.

How Fit?

Just how fit do you need to be? This table provides some fitness targets to guide your preseason training. The recommended levels are based on the requirements of the job and the capabilities of current workers.

Required (Req'd) and recommended (Rec) fitness levels.

Job	Pack Test (Minutes)		Aerobic fitness (mL/kg • min)		Muscular fitness (Recommendations)*				
	Req'd	Rec	Req'd	Rec	Leg press (lb) x body wt	Bench press (lb) x body wt	Pullups	Pushups	Situps
Field worker	—	45	—	45	1.5x	0.7x	3	15	25
Wildland firefighter	45	—	45	—	2.0x	0.8x	5	20	30
Hot shot crew member	45	42.5	45	50	2.5x	1.0x	6	25	40
Smoke-jumper**	—	42.5	48	50	2.5x	1.0x	7	25	45

Leg Press

Recommended fitness levels provide the capacity to do the job safely and well, with a reserve to meet unforeseen emergencies.

***Smokejumper requirements: 1.5-mile run in 11 minutes (= 48 mL/kg • min); 7 pullups, 25 pushups, 45 situps: packout— 3 miles with 110 pounds in less than 90 minutes.*

Fitness Training

Fitness experts recommend the following training guidelines:

Aerobic Fitness Training—Train four to five times per week, 30 to 60 minutes per session. For 1 day a week extend that time by up to 50%. Take a rest day each week.

Muscular Fitness Training—Lift weights two to three times a week with at least a day's break between sessions.

Consider these training suggestions:

Muscle Group	Aerobic	Muscular	Flexibility
Upper body	Row, paddle, chop, saw	Bench press, curls, dips, upright row	Neck, shoulders, arms, wrists
Trunk	Job-related work	Crunches, sit ups, basket hang	Lower back
Lower body	Run, hike, bike, x-c ski	Leg press, leg curls, leg extension, calf rise	Calves, hamstrings

The First Step!

Before you begin training, take a fitness test, or substantially increase your level of activity, answer the questions below. This physical activity readiness questionnaire (PAR Q) will help determine your suitability for testing or training.

1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?

2. Do you feel pain in your chest when you do physical activity?

3. In the past month, have you had chest pain when you were not involved in physical activity?

4. Do you lose your balance because of dizziness or do you ever lose consciousness?

5. Do you have a bone or joint problem that could be made worse by a change in your physical activity?

6. Is your doctor currently prescribing drugs for your blood pressure or heart condition?

7. Do you know of any other reason why you should not do physical activity?

If you answered yes to one or more questions, if you are over 45 years of age and have been inactive, or if you are concerned about your health, consult your physician before taking a fitness test or substantially increasing your physical activity.

If you answered no to all the questions, you have reasonable assurance of your suitability for fitness testing and training.