

Physical Training Preparation *for* Firefighter Recruits

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SERVE - SHARPEN - SUCCEED

**Michael R. Esco, PhD
Henry N. Williford, PhD
Phillip Bishop, EdD**

Fitness Testing: Self-Assessment

The following assessment battery will help you track your progress. Each of the components are strongly related to overall health or firefighting performance. It is important to do the self-assessment at the beginning of the program, and once each week until you enter recruit school. You should perform the tests in the order in which they are listed below.

1. **Physical activity** is defined as any bodily movement that results in a significant amount of energy expended above rest. As you probably know by now, overall physical activity is extremely important toward achieving better health. Along with the fitness measures described below, it is very important to track your daily physical activity. To do so, average the daily number of steps you take each week. Basically, add up the total number of steps each week and divide the total number by 7 to get your average steps per day.
2. **Body composition** is defined as the proportion of your non-fat tissues and fat tissue that make-up the body. Body composition will be measured with two important health metrics: body mass index (BMI) and waist circumference.
 - a. **Body mass index:** BMI is the most widely used measure of body composition. Many people think that BMI is a measure body fat. However, it is not. It is a global body com-position measure that is derived from a simple calculation using your weight and height ($\text{kg}\cdot\text{m}^{-2}$). BMI is used to place individuals into categories from underweight to obese.
 - i. A BMI of over $30 \text{ kg}\cdot\text{m}^{-2}$ is classified as "obese",
 - ii. A BMI between 25 and $29.9 \text{ kg}\cdot\text{m}^{-2}$ is classified as "overweight",
 - iii. A BMI between 18.5 and $24.9 \text{ kg}\cdot\text{m}^{-2}$ is classified as a "healthy weight"
 - iv. A BMI of less than $18.5 \text{ kg}\cdot\text{m}^{-2}$ is classified as "underweight".

To determine your BMI, measure your weight and height using accurate measuring devices.

Perform the following steps:

1. Multiply your weight in pounds by 703
2. Then, divide that number by your height in inches
3. Then, divide that number by your height in inches again

Here is an example for someone that weighs 175 pounds and is 5'11" (71 inches) tall.

1. $175 \times 703 = 123025$
2. $123025 / 71 = 1732.75$
3. $1732.75 / 71 = 24.4 \text{ kg}\cdot\text{m}^{-2}$

So, the person's BMI is 24.4. Refer to previous chart indicating this person would be classified as near the top of "healthy weight".

Alternatively, there are many websites that you can use to easily calculate BMI by entering your height and weight. You can find such websites with a simple google search of "online BMI calculator".

In general BMI is a simple measure of body fatness and a method to evaluate your progress, but it is not without limitations. A major disadvantage of using BMI is that it does not account for lean mass, so a person who is overly muscular may have a BMI that classifies them as obese when they are actually lean. They weigh a lot because of their muscularity. However, BMI will not be used as a stand-alone measure of body. Instead, your BMI value will be evaluated along with your waist circumference, which is explained below.

- b. **Waist circumference:** Waist circumference is one of the most powerful body fatness measures, as it measures the body fat that is stored deep within your abdominal cavity. This type of fat storage is referred to as "visceral adipose tissue" and is strongly related to chronic diseases and negatively effects vital organs. In fact, a person is placed at an elevated risk of heart disease if they are a man with a waist circumference of greater than 40 inches, or a woman with a waist circumference of greater than 35 inches. A high waist circumference also interferes with a person's ability to do body weight exercises that are related to fire-fighting performance, like push-ups and sit-ups.

To measure your waist circumference, you must use a flexible, non-elastic tape measure. Stand up straight with your feet together. Place the tape measure around the top portion of your hipbone which is usually directly below the belly button. The tape measure should be placed firmly over your skin, but not so tightly that it compresses your waist. Be sure that the tape is not too tight and that it does not shift up or down. This may result in inaccurate measures.

If a large waist circumference is coupled with a high BMI, then you may not have the physical fitness needed to do well in recruit school. More importantly, there is an even greater risk of developing heart disease at an early age. Therefore, it is very important to have a BMI of well under 30 (preferably under 25) and a waist circumference of less than 40 inches for men or 35 inches for women. Do not be discouraged if you fall in a category of overweight or obese. This is your opportunity to make changes to improve your physical performance and lower your risk for heart disease.

3. **Muscular Fitness** is defined as the ability of a muscle to contract continuously without fatiguing. Muscular fitness will be measured by the four exercises listed below. Be sure to follow the appropriate technique that is described in the list of strength training exercises described later.
 - a. **Maximal push-ups:** Use a stopwatch and perform as many repetitions as possible within 1 minute. Be sure to use correct form and avoid excessive, unnecessary momentum.
 - b. **Maximal pull-ups:** Perform as many pull-ups as possible.
 - c. **Abdominal prone plank:** Use a stopwatch and perform this exercise for as long as possible until you can no longer maintain correct form.

4. **Cardiovascular Fitness** is defined as the ability of the heart, lungs, and blood vessels to deliver oxygen and other important nutrients to the rest of the body. It is the most important measure of heart health. Cardiovascular fitness will be determined by the 1.5-mile run/walk. For this test, use a smooth and level track or running service. For example, you can measure a 1.5 -mile distance in your neighborhood using your car or cell phone. Or perhaps there is an outdoor or indoor running track with distance markers at a local school, park, or recreation center.

Whichever method you choose, be sure to use the same track every time you perform this test. You will also need a stopwatch. The objective of the test is to cover the 1.5-mile distance in the shortest time possible. As soon as you begin the 1.5-mile test, start the stopwatch. Stop the watch as you cross the finish point (i.e., as you complete the 1.5-mile distance). You can walk, run, or use a combination during the test. Record the time in minutes and seconds that it took you to complete the 1 mile. A faster time than previously on the 1.5-mile walk/run test is a good indicator that your cardiovascular fitness has improved. Keep in mind that the NFPA recommends completing the 1.5 mile run in 12 minutes or less (i.e. an average pace of 8 minutes per mile).

5. **Flexibility** is defined as the range of motion around a joint or a group of joints. Good flexibility is very important in lowering the risk of injury to a muscle or joint. Though there is not one particular measure of total body flexibility, the sit-and-reach test is the most popular flexibility assessment. It can easily be performed at home. All you need is a tape measure, or yardstick, and tape.

Place the tape measure or yardstick on the ground and put a long piece of tape across the 15-inch mark. Sit on the floor with the tape measure between your legs. Both legs should be straight in front of you. Your feet should be about 12 inches apart. Your heels should be placed at the 15-inch mark of the tape measure. To do this, your heels should touch the strip of tape that you placed across the 15-inch mark, which is the comparison point. Your toes should be pointed upward toward your nose (i.e., dorsi flexed). Keep your legs in this position throughout the movement. Now, place one hand on top of the other and reach forward while stretching your hamstrings. Keep your legs straight. Try to reach as far as possible and place the tips of your fingers on the measure. Note the inches and fractions that you reached. Perform three trials and record the highest score. The 15-inches should be subtracted from your score. If you make it beyond the 15-inch mark, then your score will be positive. If you do not make it to the 15-inch mark, then your score will be negative. If you made it to the 15-inch mark, where the strip of tape is located, your score is 0, but you have enough flexibility to reach your toes. While that may be good, it is best to be able to go beyond this mark.

Perform this fitness test each week while on the program and record your performances in each of the measures above in a "fitness journal" to track your progress.

Firefighter Physical Training Program

This program is intended to help you become more physically active and develop the fitness requirements that are necessary for successful performance in firefighter recruit school. It was designed to effectively improve physical fitness and overall daily activity, all the while accommodating a busy schedule. Throughout the program, you will be encouraged to be physically active by accumulating at least 10,000 steps each day. You will also alternate muscle strengthening and cardiovascular daily workouts that are quick but highly intense. At the end of each week, you will perform the fitness testing self-assessment to allow you to track progress. The information below describes how the program is formulated and is divided into the following sections (subsections in parentheses): Physical Activity; The Exercise Routine (Cardiovascular Exercise, Muscle Strengthening Exercise, and Body Weight Exercise Descriptions); The Structure of the Program; and Exercise Intensity.

Physical Activity: 10,000 steps per day

The foundation of any exercise program should be becoming a more physically active person. The more physically active you are, the more effective your training program will be. In November 2018, the National Physical Activity Guidelines for Americans were updated. The national guidelines are evidence-based with documented consistency and high-quality research. The recommendations include the following:

- Adults should do at least 150 minutes to 300 minutes a week of moderate intensity, or 75 minutes to 150 minutes a week of vigorous intensity aerobic physical intensity, or an equivalent combination of moderate and vigorous intensity aerobic activity. They should also do muscle strengthening activities on 2 or more days a week.
- Older adults should do multicomponent physical activity that includes balance training as well as aerobic and muscle strengthening activities.

Though the physical activity guidelines were written for the general population, increasing your physical activity level will translate to improved performance for firefighting. It is important from a health perspective that firefighters, at a minimum, meet the national guidelines. From a performance standpoint it is important that firefighters go beyond the guidelines and maintain an acceptable body composition. They should also possess the necessary muscular strength, endurance, cardiovascular capacity, and flexibility to do the job. In addition, firefighters are considered tactical athletes and need coordination, agility, power, balance, and speed skills necessary to do the job in a highly efficient, safe manner.

Unless you have a physical limitation, walking is the simplest and least expensive form of physical activity. It can be done in most any place and is one of the healthiest activities you can do. People who walk a lot have lower rates of chronic disease and obesity.

The Firefighter Fitness program will work best if you use a physical activity tracker to determine how many steps per day that you walk. Physical activity trackers are great motivational tools! Research has shown that daily physical activity increases by about **25%** just from wearing one. They come in three forms: basic clip-on pedometers, wearable physical activity trackers, and smartphone applications.

Most experts would agree that you should aim to achieve 10,000 steps each day to be considered physically active. However, you should ease into it if you presently are not close to that targeted number. Consider this. There are about 2,000 steps in one mile. Walking 10,000 steps per day equals approximately 5 miles. If you suddenly increase your step count by several thousand steps that may be the equivalent of an additional 2-3 miles. Yes, that is a great thing and we want to encourage that. However, if you are not accustomed to that amount of walking, you could injure yourself, which will only set you back. You need to gradually progress until you reach 10,000 steps per day.

Exercise Routine: 10-20 minutes each day can be enough!

The training program described herein requires only 10-20 minutes of exercise each day. That short timeframe is all you need ***if you are getting at least 10,000 steps of non-exercise physical activity each day***. Whether you exercise for 10 minutes, 20 minutes, or somewhere in-between should be based on what you are comfortable with and how much time you have. The range of time is provided to allow you to personalize the program to fit YOUR needs and lifestyle.

Cardiovascular Exercise

Cardiovascular fitness is an incredibly important component of physical fitness and strongly linked to overall health and firefighter performance. You can get a great cardio workout in just 10 to 20 minutes, especially if you are achieving 10,000 steps each day. Remember, the most important concept of this program is short workouts *PLUS* accumulating more steps per day.

The cardiovascular workouts (CV) in this program will involve covering the greatest distance within 10-20 minutes. With this option, you will perform an aerobic exercise for a 10-to-20-minute period. Though most people will probably choose jogging/running for this, especially considering the 1.5 mile run test for firefighters, the activity can be anything aerobic, such as biking, swimming, elliptical machine, etc. At each workout, your goal is to cover the greatest distance possible within 10-20 minutes. Each time you do this workout, try to

slightly increase the distance from the previous workout. For example, let us say you jogged 1 mile in 10 minutes during the first week. Next time try to jog a little faster, or for 2-3 more minutes to cover a slightly greater distance. Continue this until reach a target performance, such as jogging 1.5 miles in 10 minutes (which would far exceed the 12-minute requirement by firefighting standards). Challenge yourself to increase your pace and cover more distance within the 10-20-minute period. However, go at your own pace and progress at a rate in which you are most comfortable. Recovery is important.

Muscle Strengthening Exercise

The muscle strengthening training (ST) method we present in this training program accommodates a busy schedule. Circuit training is described as performing one exercise after another with little to no rest until the circuit is complete. Your focus is on increasing the amount of work performed within a given time (10-20 minutes), rather than increasing the exercise time itself. This type of training is sometimes referred to as high intensity interval training, or HIIT. You will need a stopwatch. The goal is to complete as many rounds of the circuit as possible within 10-20 minutes. An important concept with this style of training is that we have selected exercises that use only body weight and have been shown to relate to firefighting performance. In addition, by resting very little during the 10-20-minute period, your heart rate will remain elevated. This means that circuit training will also condition your cardiovascular system. By combining both upper- and lower- body exercises, the circuit really strains your heart in a manner similar to the CPAT.

The 10-20-minute circuit is made up of four exercises as follows: 1) a version of the push-up; 2) a version of the pull-up; 3) a version of the squat; and 4) a "core" exercise. A variety of exercises are provided in this manual and organized accordingly. In other words, as you will see, the exercises organized into "push-up variations", "pull-up variations", "squat variations", and "core exercises". Try to do 10 repetitions of each exercise, which is an optimal repetition range for enhancing muscular fitness. However, if the exercise is an isometric "hold" movement, you should try to do it for 30 to 60 seconds. Go at your own pace. If you cannot perform the number of repetitions or seconds that are recommended, then do what you can and build up. Remember, this is YOUR workout. Though the goal is to complete as many rounds of the exercises as possible within the 10-minute period, you may have to start slowly. As you progress, you will eventually be able to move from exercise to exercise with very-little-to-no rest. Proper technique for each exercise should be maintained. In addition, perform a 2-minute warm-up of light intensity movement, such as walking, jump rope, jumping jacks, etc. before beginning the 10-to-20-minute strength circuit.

The outline of the strength circuit workout looks like this:

Push-up variation	10 repetitions
Pull-up variation	10 repetitions
Squat variation	10 repetitions
Core exercise	10 repetitions

Bodyweight Exercises for the Strengthening Circuit

The exercises described below are organized into the following sections: 1) "Push-up Variations"; 2) "Pull-up Variations"; 3) "Squat Variations"; and 4) "Core Exercises". Pick a specific exercise for a specific section. Please refer to the outline of the strength circuit workout above to see where to place each exercise. You should perform the recommended number of repetitions for each.

1) Push-Up Variations

Basic Push-Up: The basic push-up is one of the simplest yet one of the best exercises for strengthening your upper body. It requires no equipment and can be performed anywhere.

1. Place your hands flat on the floor with your fingers pointing straight ahead, with your arms slightly wider than shoulder width. Your legs should be straight, and feet should be together or slightly apart with the toes on the floor. Keep your abs isometrically contracted (tight) during the entire movement, you do not want you butt to pop up or sink down. This will help stabilize your torso and make sure your back stays in a straight, neutral position.
2. Lower your body toward the floor. Keep your torso rigid and straight. Bring your chest an inch or two from the floor. Your elbows should be tucked in toward your body. This position will increase the activation of the chest muscles more than if you had your elbows wide.
3. Following a brief pause, extend your elbows and push your body away from the floor to return to the starting position.
4. Do as many repetitions as you can in 1 minute.

Push-Ups on your Knees: The push-up on your knees is very close to the technique of the basic push-up. The only difference is that your knees remain in contact with the floor during the entire exercise, making it easier to perform. It is very important to make sure that you are still squeezing your abs and keeping your hips in a neutral position. If you have a difficult time performing the basic push-up, then you should start with doing push-ups on your knees and progress to the more advance version once your strength improves. One of the

good things about this exercise is you can easily switch to it from the basic version at any time. For example, let's say you are strong enough to perform 3 basic push-ups repetitions, but you are trying to achieve 10 repetitions for a given set. In this case, perform as many basic push-ups as you can do, then bring your knees in contact with the floor for the remainder of repetitions.

Wall Push-Ups: The wall push-up is a modification that will remove the difficulty of the push-up, but still target the same muscle groups. The technique is almost identical to the regular push-up, but you place your hands on a wall, or raised counter surface edge. Continue to keep your arms a little over shoulder width apart and keeping a tight and engaged core. If you are pressing against a wall you should try to move your feet as far back as comfortable but not more than would cause your body to be a 45-degree angle from the wall. Lower yourself until your nose is about an inch away from the wall, do not turn your head to get lower!!! Once at the bottom, hold for a few seconds and extend your elbows. All while keeping the core engaged.

Narrow-base Push-Ups: This version can be done in any of the previously mentioned positions. The narrow-based push-up is a more advanced version of the basic push-up that focuses more on the triceps (the muscles in the back of your arms). The technique is similar to the other push-up styles. With the narrow-base push-up, bring your hand in closer towards each other. In this position, the base of support (your hands) should be narrower than your shoulder-width. Everything else should remain the same as with the basic push-ups. One of the most important things with the narrow-base push-up is to make sure your arms and elbows remain close to the body during the exercise. Flaring them outward may place too much pressure on the elbow joint and could eventually injure it.

Push-Ups Feet Elevated: This is more of an advanced version of the push-up. The technique is similar. Place the front portion of your toes on an elevated surface, such as a chair or bench. Your upper body should be elevated over the floor with your hands flat and directly underneath your shoulders. Your arms should be extended. Your upper and lower back, hips, and legs should form a straight line. Everything else remains the same as with the basic push-up. The important thing with this version is to not allow your lower back to sag. Keep your abdominals isometrically contracted during the entire exercise.

2) Pull-up Variations

Basic Pull-up: Pull-ups are arguably the best exercise for your upper body, and the exercise requires just a pull-up bar.

1. Grasp the pull-up bar with an overhand grip that is slightly wider than shoulder width. Once your hands are secure, bend your knees to lift your feet off of the floor so your body is hanging in the air.

2. Pull body up until chin is above bar. While doing this, retract your shoulder blades by bringing them toward each other. Exhale during this portion of the movement.
3. Lower your body until arms and shoulders are fully extended. Inhale as you descend.
4. Do as many repetitions as you can in 1 minute.

Note: For additional variety, perform the pull-up with a narrow grip by bringing your hands closer together, less than shoulder width.

Assisted Pull-Up:

1. Grasp bar with an overhand grip. Position your feet on a chair or bench placed on the floor directly under the bar. Stand up and bring your chest as close to the bar as possible with support from your lower body.
2. Inhale and lower your body under bar until arms and shoulders are fully extended. Control the descent with minimal assistance from your lower body. Allow your knees and hips to bend and keep your feet flat on the bench or chair.
3. Exhale and pull your body up until chin is just above bar. Allow your lower body to assist by extending your hips and knees. Remember, the focus of the exercise is your upper body so make sure there is not an excessive amount of assistance from your legs. Lessen the assistance from your lower body as you become stronger.
4. Do as many repetitions as you can in 1 minute.

Note: The basic forms of these exercises can be performed in combination with the assisted version. In other words, if you can do only a few repetitions with basic form, having a bench or chair underneath will allow you to add more repetitions with assistance.

Isometric Pull-up:

1. Grasp bar with an overhand grip. Position your feet on a chair or bench that is placed on the floor directly under the bar. Stand up and bring your chest as close to the bar as possible with support from your lower body. Before moving to step #2 you should begin to squeeze your shoulder blades.
2. Remove your feet from the chair and hold your chest near the bar as your body hangs in mid-air. Try to pull your shoulder blades together as you hang.
3. Hold this position for as long as you can within the 1-minute timeframe.
4. When complete or anytime you need to take a brief break, place your feet back on the chair to support your body and let go of the bar.

NOTE: If you wish to make this more difficult without moving to the basic pull-up, perform this movement in the hollow rock position.

Negative Pull-up:

1. Grasp bar with an overhand grip. Position your feet on a chair or bench that is placed on the floor directly under the bar. Stand up and bring your chest as close to the bar as possible with support from your lower body. Before moving to step #2 you should begin to squeeze your shoulder blades.
2. Remove your feet from the chair and hold your chest near the bar as your body hangs in mid-air.
3. Slowly lower your body down without support from the chair. The descent should take about 10 seconds.
4. Place your feet back on the chair and stand up to the starting position.
5. Do as many repetitions as you can in 1 minute.

3) Squat Variations

Basic Squat: Squats are an excellent exercise for the lower body and remain the top choice for many lifters for defining the thighs, hips, and buttocks. The exercise can be performed virtually anywhere. Resistance can be applied in the form of dumbbells or barbells. Since the focus of this manual is directed primarily toward home-based strength training, the performance of the squat will be described by using only the body.

1. Stand tall with your feet hip width apart with feet very slight angled out. Your arms can be placed out in front of you, straight down by your side, or with your elbows flexed and hands placed on your hips (my preference). Whichever position you choose with your arms, try to keep them in the position during the entire exercise, unless you bring them in front of you to control balance. Make sure your abdominals are isometrically contracted and your back is in a neutral position throughout the exercise.
2. Before you begin to lower your body to the floor make sure your feet are firmly pressing against the ground and without moving your feet "twist" the foot slightly to the outside, this will activate your glutes (butt) right before you squat. Lower your body toward the floor by flexing your knees and hips and pushing your buttocks back. Make sure the weight of your body is supported by your heels and not toes (you should feel most of the weight on the outside edges of your foot and heel). Do not allow your knees to go over your toes. As you descend, keep your chest up and shoulders back. Your eyes should be focused on a point in front of you to keep your head in a natural position.
3. Come to a point to where your knees are bent approximately 90 degrees and parallel to the floor. Again, your chest should be up and shoulders back, with your head straight forward.
4. Following a brief pause, slowly stand back up to the starting position.
5. Do as many repetitions as you can in 1 minute.

Note: Your knees should not wobble during your squat, try to keep them in the same position.

Isometric Wall Squats:

1. Gently lean your lower back against a wall. Your feet should be placed flat on the floor about 12 inches in front of you and hip width with your toes pointing forward. Important: This position of the lower body will make sure that your knees will not extend past your toes during the exercise. Keep your chest up, shoulders back, and abdominals isometrically contracted during the entire movement. Your arms can be placed out in front of you, straight down by your side, or with your elbows flexed and hands placed on your hips. Whichever position you choose with your arms, try to keep them in the position during the entire exercise.
2. Keeping your chest up, lower your body down toward the floor by flexing your knees and hips. The buttocks should drop straight down, remaining under you as you descend. Your weight should be supported by your heels and not the front of your foot. As your body is lowered, your back should slide down the wall. Stop lowering your body when your thighs are parallel to the floor. You can stop sooner if you feel reaching "parallel" is too challenging.
3. When you reach the bottom portion of the movement, hold the position for a period of time (while making sure all the working muscles remain engaged). Try to hold it as long as you can for 1 minute.

Alternating Split Squat/Lunges:

1. Stand with your hands on your hips (my preference), out in front of you, down by your sides, or clasped behind the neck. Keep your abdominals isometrically activated during this movement.
2. Lunge forward with your (right or left) leg. Land on your heel then place your entire foot flat on the floor with the toes pointing forward. Lower your body by flexing the knee and hip of the front leg. The knee and hip of the back leg can also slightly flex, but the bulk of your weight should be supported by the front leg. The knee of the front leg should never go past the toes. Lower your body until the back knee is almost in contact with the floor but does not touch. Your torso should be upright during the descent (do not lean forward). If you become too unstable, try staying a little higher in the lunge.
3. Following a brief pause, extend the knee and hip of the front leg. Return to the standing position and bring both feet side-by-side.
4. Perform the lunge with the opposite leg.
5. Repeat by alternating each leg until you achieve the desired repetitions. Try to perform as many repetitions as possible for 1 minute.

Squat jumps: This is an advanced version and should only be performed if you have no knee pain.

1. Stand tall with your feet hip width apart and arms by your side.
2. Lower your body toward the floor by flexing your knees and hips and pushing your buttocks back. Make sure the weight of your body is supported by your heels. Do not allow your knees to go over your toes. As you descend, keep your chest up and shoulders back.
3. Squat down to a point where your knees are bent approximately 90 degrees and parallel to the floor.
4. Following a brief pause, quickly stand back up allowing your feet to “jump” off the ground.
5. Repeat and try to perform as many repetitions as possible in 1 minute.

4) Core Exercises

Basic Crunch:

1. Lie on your back on a comfortable surface like a yoga mat. Bend your knees and place your feet flat on the floor. Your feet should be about hip width apart. Your hands can be placed behind your head, crossed over your chest, or beside your body with your arms extended. Most people prefer putting their hands behind the head to keep the neck muscles from getting fatigued. If you do this, be sure to keep your elbows out to the sides and do not pull your head with your hands. Keep your head up and do not round your neck.
2. Contract your abdominals and curl your trunk up and forward to lift your head, neck, and upper back off the floor. Breathe out as you do this. Keep a natural position in your lower spine and make sure your lower back remains on the floor. Pause for a second or two at the top and try to tighten your abdominal muscles even more.
3. Breathe in and slowly lower back down toward the starting position. When you reach the bottom, keep your head, neck, and upper back from resting on the floor. This will make sure your abdominal muscles are continually contracted.
4. Repeat and try to perform as many repetitions as possible in 1 minute.

Crunch with a twist:

1. Lie on your back on a comfortable surface like a yoga mat. Bend your knees and place your feet flat on the floor. Your feet should be about hip width apart. Your hands can be placed behind your head, crossed over your chest, or beside your body with your arms extended. Most people prefer putting their hands behind the head to keep the neck muscles from getting fatigued. If you do this, be sure to keep your elbows out to the sides and do not pull your head with your hands. Keep your head up and do not round your neck.

2. Contract your abdominals and curl your trunk up and rotate your upper body toward one side trying to bring your shoulder towards your opposite knee. Breathe out as you do this. Keep a natural position in your lower spine and make sure your lower back remains on the floor. Pause for a second or two at the top and try to tighten your abdominal muscles even more.
3. Breathe in and slowly lower back down toward the starting position. When you reach the bottom, keep your head, neck, and upper back from resting on the floor. This will make sure your abdominal muscles are continually contracted.
4. Repeat to the opposite side. That is one rep.
5. Continue alternating sides until you perform as many repetitions as possible in 1 minute.

Bicycle Crunch:

1. Lie flat on the floor. Place your hands behind your head and point your elbows outward. Do not pull the head up during this exercise. Bend your knees and hips at 90-degree angles and lift your feet in the air. Lift your shoulders off the ground and curl your trunk up and forward position. This will be the starting position.
2. Do a cycling motion with your legs by extending your left leg and bring your right knee in. At the same time, rotate your trunk and bring your left elbow close to your right knee.
3. Go back to the starting position.
4. Do the cycling motion on the opposite side by extending your right leg and bring in your left knee. Rotate your trunk to bring your right elbow to your left knee.
5. Go back to the starting position to complete the repetition.
6. Continue this cycling motion and perform as many repetitions as possible in 1 minute.

Prone Plank Exercise:

1. Get into a push-up position on the floor or a mat and bend your elbows 90 degrees. Your elbows should be directly below your shoulders and your forearms and hands should be flat on the floor. Your upper body weight should be distributed on your forearms. Your lower body should be supported by the balls of your feet, with your heels pointed toward the ceiling. Your body should form a straight line from your neck to your ankles. It is very important to not let your lower back to sag or shot upward. Contract your abdominal muscles, as if you are about to be punched in the stomach and hold it.
2. Hold the position for as long as you can or until 1 minute has expired.

Flexibility Training:

In addition to the cardiovascular and muscular strength and endurance training, it is important to perform flexibility training. Adults should do flexibility exercises at least two or three days each week to improve range of motion. Each stretch should be held for 10 to 30 seconds, to the point of tightness or slight discomfort. Repeat each stretch two to four times, accumulating 60 seconds per stretch. You can enroll in a yoga or stretching class, and there are several programs available from a variety of sources. Some examples of static stretching include calf stretch, sitting hamstring stretch and shoulder stretch. Your flexibility exercises should target each of the major muscle-tendon groups including shoulders, chest, trunk, back, hips, quads, hamstrings. Stretching provides many benefits for the firefighter. Most every muscular movement the firefighter performs requires some level of flexibility. Turn-out gear can limit flexibility. Stretching helps prepare your body for the positions that your body will be in during training and firefighting. If the muscle has insufficient range of motion injury, strain, sprain, or dislocation can occur. Do not neglect stretching as it is important, and flexibility decreases with aging and lack of use.

The Structure of the Program: Putting it All Together

This Firefighter Recruit School Preparation Program involves achieving at least 10,000 steps everyday of each week. You will also alternate CV and ST workouts over 5 days and perform a Self-Assessment Fitness Test on the very last day of each week. Remember, you should also perform an initial self-assessment before beginning the program. The outline of the program over one month is shown in the following Table:

WEEK	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1	10,000 steps 10-20 min CV	10,000 steps 10-20 min ST	10,000 steps 10-20 min CV	10,000 steps 10-20 min ST	10,000 steps 10-20 min CV	10,000 steps	10,000 steps Self- Fitness Test
2	10,000 steps 10-20 min ST	10,000 steps 10-20 min CV	10,000 steps 10-20 min ST	10,000 steps 10-20 min CV	10,000 steps 10-20 min ST	10,000 steps	10,000 steps Self- Fitness Test
3	10,000 steps 10-20 min CV	10,000 steps 10-20 min ST	10,000 steps 10-20 min CV	10,000 steps 10-20 min ST	10,000 steps 10-20 min CV	10,000 steps	10,000 steps Self- Fitness Test
4	10,000 steps 10-20 min ST	10,000 steps 10-20 min CV	10,000 steps 10-20 min ST	10,000 steps 10-20 min CV	10,000 steps 10-20 min ST	10,000 steps	10,000 steps Self- Fitness Test

The above provides the general outline of the program to allow you to personalize your program to match your lifestyle and physical fitness status.

Exercise Intensity

Because of the relatively short workout duration (i.e., 10 to 20 minutes), each workout should be performed at a “moderate-to-vigorous” intensity. However, you might ask, “How can I make sure that I am working out at this intensity?” The answer to this question is not as straightforward as is often communicated.

There are numerous ways to determine the intensity of each workout. Possibly, the most common recommendation is to ensure that heart rate is kept at approximately 70-95% of maximal heart rate. To do this, you will need to know your maximal heart rate and an ability to measure heart rate during each workout. Determining your true maximal heart rate requires completing a maximal graded aerobic exercise test. However, because the equipment and personnel to perform such a test is limited, most people have to estimate maximal heart rate with a prediction equation, such as subtracting age from 220 (predicted maximal heart rate = $220 - \text{age}$). For example, maximal heart rate would be predicted at $200 \text{ beats}\cdot\text{min}^{-1}$ for a 20-year-old person. Even though these types of equations are much simpler than performing a maximal exercise test, as with all prediction methods, they carry a range of error. In fact, the 220-age equation can over- or under-estimate maximal heart rate by $20 \text{ beats}\cdot\text{min}^{-1}$. In addition, percentage of maximal heart rate is most useful for exercise that is kept at a constant intensity. However, the workouts in this program are more interval-based, in which your heart rate will increase and decrease throughout. Thus, if you use heart rate, you should do so with caution while employing “trial and error”. Your heart rate response during exercise should be matched to your perceived exertion.

Regarding the last point, rating perceived exertion could be useful. This is basically you perceive the intensity of each workout. Each workout’s intensity is rated based on a scale from 0 to 10. A rating of “0” is considered to be a completely resting state, while a rating of “10” is considered maximal effort. Using this method, a rating of “4” to a “8” is considered a moderate-to-vigorous intensity range and hence, is recommended with each of the workouts in this program. The 0-10 rating perceived exertion scale is presented below. You can use it during each workout to make sure you stay within the appropriate range.

Rating of Perceived Exertion

0	Complete Rest
1-3	Very Light-to-Light Activity
4-6	Moderate Activity
7-8	Vigorous Activity
9	Near Maximal Activity
10	Maximal Activity

Rhabdomyolysis

Rhabdomyolysis or “rhabdo” has recently gained the attention of fire departments due to reports of firefighter disability and fatalities. Death and permanent disability of firefighters has been associated with heat stress and rhabdomyolysis. One example (NIOSH, 2015) during the early days of training a cadet, during a live-fire exercise experienced a core body temperature of 107.2 F, and another was hospitalized for rhabdomyolysis. This is not uncommon and there have been several cases of rhabdomyolysis throughout the country including firefighters in Alabama.

Rhabdomyolysis can be life threatening and athletes, firefighters, and military personnel are groups that tend to have higher risk of developing the condition. Rhabdomyolysis is caused by the breakdown of muscle tissue. When muscle is damaged a protein called myoglobin is released into the bloodstream. The kidneys attempt to filter the material and myoglobin breaks down into substances that, in excess, can cause kidney damage. The kidneys are responsible for removing the myoglobin from the blood so urine can flush it from the body. Inability to remove enough myoglobin can cause, kidney failure and even death. The firefighter may express red or bloody urine. Not all firefighters (up to 80%) will exhibit bloody urine. Complications of rhabdomyolysis can include seizure, acute renal failure, compartment syndrome, arrhythmia, severe muscle damage, etc.

Individual Risk factors:

- Individuals who are carriers of the sickle cell trait are at greater risk for rhabdomyolysis. The US Air Force screens for the sickle cell trait in all its recruits, and the US Army screens for the trait in the context of high-altitude deployment. (*Nelson DA, Deuster PA, Carter R, et al. Sickle cell trait, rhabdomyolysis, and mortality among US soldiers. N Eng J Med. 2016;375:435-442*).
- Obese individuals (>30 BMI) have a significantly higher risk of exertional rhabdomyolysis compared with those within the reference range (18.5 to <25.0 BMI).
- Any tobacco uses within the past 6 months results in a 54% higher risk of exertional rhabdomyolysis compared with no tobacco use.
- Increased risk is related to the usage of certain medications, particularly statins and antipsychotic agents. Recent use of statins triples the risk of exertional rhabdomyolysis.
- Being overly enthusiastic when starting an exercise program. It is important to not push too hard in the initial stages of a training regimen. Be sure to follow the principle of progression.

Increased risk of rhabdomyolysis for firefighters includes the following:

- High intensity physical training and conditioning.
- Heat exposure related to firefighting and working in a hot environment.
- Prolonged exertion during training and while fighting a fire.
- Carrying heavy loads and doing strenuous muscular work while wearing turnout gear (PPE) and clothing that increases body temperature.

Increased risk of rhabdomyolysis for firefighter recruits includes the following:

- Recruits are at greater risk of rhabdomyolysis and heat stress if there is a long period of time between passing the CPAT and starting the program.
- Recruits are often not acclimated to hot environments and should be acclimated before and during training.
- Recruits should be tested immediately before starting a training program based on NFPA guidelines for fitness and wellness.
- Fit firefighters tend to be at less risk, but during hard work are still acceptable to rhabdomyolysis.
- Recruits should be hydrated and rehydrate with low sugar or sugar free and caffeine drinks.
- Any suspected heat stress or dehydration needs immediate attention.
- Provide educational materials for recruits and training staff, regarding signs, symptoms, and risks of developing rhabdomyolysis.

Immediate attention:

- Immediately stop activity when signs or symptoms exist regarding overheating. Immediately cool down and drink fluids.
- Notify a training officer, chief, or emergency personnel immediately regarding symptoms in yourself or others.
- Rhabdomyolysis can happen outside of the fire department, in a gym or other physically active work environments. If so, contact a healthcare provider, or go to the nearest medical services.
- Ask to be checked for rhabdomyolysis. Many healthcare providers are not familiar with rhabdomyolysis and should be made aware of the possibility of this condition.
- Let healthcare providers know you are a firefighter.
- Reporting symptoms could potentially save your life.

Conclusion

Before ending the manual, we want to summarize the step-by-step process of we have presented herein.

1. Purchase a physical activity tracker and monitor your daily steps. You should strive to achieve at least 10,000 steps each day.
2. Perform the self-assessment fitness testing battery to see where you currently stand regarding your physical fitness level.
3. After doing the baseline assessment, pick a reasonable "steps-per-day" goal.
4. Make a commitment to perform the 10-to-20-minute workouts by alternating the cardiovascular and strength conditioning sessions over 5 days throughout each week.
5. Perform the self-assessment fitness testing battery at the end of each week. Not only will this help you track your progress, it will also provide a tough workout in itself.
6. Make sure to get sufficient recovery from all the physical and mental stressors you experience.
7. ***Go at your own pace, stay consistent, and gradually progress to a fitter person!***

Hopefully, you become ready for entry into the firefighting profession from reading this manual. Whether you stick to this program or not, do something! All-in-all, we truly hope this manual was beneficial. We have dedicated our lives to educating people just like you on the importance of fitness.

Thank you for your service as a firefighter. A high level of physical fitness may not only save your life, but thousands of others within the communities that you serve.

BE THE BEST YOU CAN POSSIBLY BE!